Safety Evaluation Report

With Open Items Related to the License Renewal of Susquehanna Steam Electric Station, Units 1 and 2

Docket Nos. 50-387 and 50-388

PPL Susquehanna, LLC

United States Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

March 2009

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Susquehanna Steam Electric Station (SSES), Units 1 and 2, license renewal application (LRA) by the United States (US) Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated September 13, 2006, PPL Susquehanna, LLC (PPL or the applicant) submitted the LRA in accordance with Title 10, Part 54, of the *Code of Federal Regulations*, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants.” PPL requests renewal of the Units 1 and 2 operating licenses (Facility Operating License Numbers NPF-14 and NPF-22, respectively) for a period of 20 years beyond the current expirations at midnight July 17, 2022, for Unit 1, and at midnight March 23, 2024, for Unit 2.

SSES is located approximately 5 miles northeast of Berwick, PA. The NRC issued the construction permits for Unit 1 on November 2, 1973, and on November 2, 1973, for Unit 2. The NRC issued the operating licenses for Unit 1 on November 12, 1982, and on June 27, 1984, for Unit 2. Units 1 and 2 are of Mark 2 BWR design. General Electric supplied the nuclear steam supply system and Bechtel originally designed and constructed the balance of the plant. The licensed power output of each unit is 3489 megawatt thermal with a gross electrical output of approximately 1190 megawatt electric.

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

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ABBREVIATIONS

AAI	applicant action item
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
AISC	American Institute of Steel Construction
aka	also known as
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
APRM	average power range monitor
AR	action request
ARI	alternate rod injection / alternate rod insertion
ART	adjusted reference temperature
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
AST	alternate source term
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
B&PV	boiler and pressure vessel
BTP APCSB	Branch Technical Position Auxiliary Power Conversion Systems Branch
BWR	boiling water reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Program
CASS	cast austenitic stainless steel
CF	chemistry factor
CFR	*Code of Federal Regulations*
CI	confirmatory item
CIG	containment instrument gas
CIV	combined intermediate valve
CLB	current licensing basis
CM	condition monitoring
CMAA	Crane Manufacturers Association of America
CPX	Component Maintenance System
CR	condition report
CRD	control rod drive
CRDH	control rod drive hydraulics
CRDRL	control rod drive return line

CREOASS	Control Room Emergency Outside Air Supply System
CS	carbon steel
CSS	core support structures
CSCW	control structure chilled water
CST	condensate storage tank
CWST	clarified water storage tank
CUF	cumulative usage factor
DAR	design assessment report
DBA	design basis accident
DBD	design basis document
DBE	design basis event
DC	direct current
DG	diesel generator
DOR	Division of Operating Reactors
DOT	Department of Transportation
DP	differential pressure
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPY	effective full-power year
EHL	emergency heat load
EOL	end of life
EPRI	Electric Power Research Institute
EPRI-MRP	Electric Power Research Institute Materials Reliability Program
EPU	extended power uprate
EQ	environmental qualification
ESF	engineered safety feature
ESS	Engineered Safeguard System
ESSW	engineered safeguards service water
ESW	emergency service water
FAC	flow-accelerated corrosion
F_{en}	environmental fatigue life correction factor
FERC	Federal Energy Regulatory Commission
FP	fire protection
FPCCU	Fuel Pool Cooling and Cleanup System
FPRR	fire protection review report
FR	*Federal Register*
FSAR	final safety analysis report
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
GRRCCW	Gaseous Radwaste Recombiner Closed Cooling Water System

GSI	generic safety issue
HAZ	heat-affected zone
HCI	hydraulic control unit
HELB	high-energy line break
HEPA	high efficiency particulate air
HP	high pressure
HPCI	high pressure coolant injection
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
HX	heat exchanger
I&C	instrumentation and controls
IASCC	irradiation assisted stress corrosion cracking
ICTM	isolated condenser treatment method
ID	inside diameter
IEEE	Institute of Electrical and Electronics Engineers
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
IN	information notice
INPO	Institute of Nuclear Power Operations
IP	intermediate pressure
IPA	integrated plant assessment
IPE	individual plant evaluation
IPEEE	individual plant evaluation of external events
IR	insulation resistance
IRM	intermediate range monitor
ISFSI	independent spent fuel storage installation
ISG	interim staff guidance
ISI	inservice inspection
ISO	independent system operator
ISP	Integrated Surveillance Program
kV	kilo-volt
LLRWHF	low level radwaste holding facility
LOCA	loss of coolant accident
LP	low pressure
LPCI	low pressure coolant injection
LPCS	low pressure core spray
LPRM	local power range monitor
LR	license renewal
LRA	license renewal application
LTOP	low-temperature overpressure protection
MEB	metal-enclosed bus
MeV	million electron volts
MIC	microbiologically influenced corrosion

MOAB	motor operated air break
MRDB	maintenance rule database
MS	main steam
MSIV/LCS	main steam isolation valve / leakage control system
MWt	megawatts-thermal
MWe	megawatts-electric
N/A	not applicable
NCR	Non-conformance Report
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
Ni	nickel
NIMS	Nuclear Information Management System
NLDAE	new loads design adequacy evaluation
NMS	Neutron Monitoring System
NPS	nominal pipe size
NRC	US Nuclear Regulatory Commission
NSAS	non-safety affecting safety
NSE	nuclear system engineering
NSSS	nuclear steam supply system
ODCM	offsite dose calculation manual
ODSCC	outside-diameter stress corrosion cracking
OE	operating experience
OI	open item
OL	operating license
OQA	operational quality assurance
P&ID	piping and instrumentation diagrams
PASS	Post-Accident Sampling System
PGCC	Power Generation Control Complex
pH	Concentration of Hydrogen Ions
PM	preventive maintenance / performance monitoring
PPB	parts per billion
PPL	PPL Susquehanna, LLC
PPM	parts per million
P-T	pressure-temperature
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
QAPD	quality assurance program description
RAI	request for additional information
RB	reactor building

RBCCW	reactor building closed cooling water
RBCW	reactor building chilled water
RBM	rod block monitor
RCIC	reactor core isolation cooling
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RCSPB	reactor coolant system pressure boundary
RFP	reactor feedwater pump
RG	regulatory guide
RHR	residual heat removal
RHRSW	residual heat removal service water
RI	reactor internals
RIS	regulatory issue summary
ROFT	reduction of fracture toughness
RPT	recirculation pump trip
RPV	reactor pressure vessel
RR	reactor recirculation
RT	radiographic testing
RT_{NDT}	reference temperature nil ductility transition
RVID	reactor vessel integrity database
RWCU	Reactor Water Cleanup System
RWST	refueling water storage tank
SBO	station blackout
SC	structure and component
SCC	stress-corrosion cracking
SCW	source of cooling water
SDV	scram discharge volume
SE	safety evaluation
SER	safety evaluation report
SHE	Standard Hydrogen Electrode
SGTS	Standby Gas Treatment System
SJAE	steam jet air ejector
SLC	standby liquid control
SOC	statement of consideration
SOMS	Shift Operations Management System
SPE	steam packing exhauster
SPLEX	Susquehanna Plant Lifetime Excellence Program
SRM	source range monitoring
SRP	Standard Review Plan
SRP-LR	Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants
SRV	safety relief valve
SS	stainless steel
SSC	system, structure, and component
SSE	safe-shutdown earthquake
SSES	Susquehanna Steam Electric Station
SW	service water

TBCCW	turbine building closed cooling water
TEMA	Tubular Exchanger Manufacturers Association
TIP	traversing incore probe
TLAA	time-limited aging analysis
TRM	technical requirements manual
TS	technical specifications
USE	upper-shelf energy
UT	ultrasonic testing
UV	ultraviolet
VDC	volts direct current
VFLD	vessel flange leak detection
VHP	reactor vessel head penetration
XLPE	cross-linked polyethylene
XLPO	cross-linked polyolefin
WA	work authorization
Zn	zinc

SECTION 1

INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) on the license renewal application (LRA) for Susquehanna Steam Electric Station (SSES), Units 1 and 2, as filed by the PPL Susquehanna, LLC (PPL or the applicant). By letter dated September 13, 2006, PPL submitted its application to the US Nuclear Regulatory Commission (NRC) for renewal of the SSES operating licenses for an additional 20 years. The NRC staff (the staff) prepared this report to summarize summarizes 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 Evelyn Gettys. Ms Gettys may be contacted by telephone at 301-415-4029or by electronic mail at Evelyn.Gettys@nrc.gov. Alternatively, written correspondence may be sent to the following address:

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

In its September 13, 2006, submission letter, the applicant requested renewal of the operating licenses issued under Section 103 (Operating License Nos. NPF-14 and NPF-22) of the Atomic Energy Act of 1954, as amended, for Units 1 and 2 for a period of 20 years beyond the current expirations at midnight July 17, 2022, for Unit 1, and at midnight March 23, 2024, for Unit 2. SSES is located approximately 5 miles northeast of Berwick, PA. The NRC issued the construction permits for Unit 1 on November 2, 1973, and on November 2, 1973, for Unit 2. The NRC issued the operating licenses for Unit 1 on November 12, 1982, and on June 27, 1984, for Unit 2. Units 1 and 2 are of Mark 2 BWR design. General Electric supplied the nuclear steam supply system and Bechtel originally designed and constructed the balance of the plant. The licensed power output of each unit is 3489 megawatt thermal with a gross electrical output of approximately 1190 megawatt electric. The updated final safety analysis report (UFSAR) shows details of the plant and the site.

The license renewal process consists of two concurrent reviews, a technical review of safety issues and an environmental review. The NRC regulations in 10 CFR Part 54 and 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," respectively, set forth requirements for these reviews. The safety review for the SSES license renewal is based on the applicant's LRA and on its responses to the staff's requests for additional information. The applicant supplemented the LRA and provided clarifications through its responses to the staff's RAIs in audits, meetings, and docketed correspondence. Unless otherwise noted, the staff reviewed and considered information submitted through December 2008. 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, located on the first floor of One White Flint North, 11555

Rockville Pike, Rockville, MD 20852-2738 (301-415-4737 / 800-397-4209). In addition, the public may find the LRA, as well as materials related to the license renewal review, on the NRC Web site at http://www.nrc.gov.

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

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

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

In accordance with 10 CFR Part 51, the staff prepared a draft plant-specific supplement to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)." This supplement discusses the environmental considerations for license renewals for Units 1 and 2. The staff issued draft, plant-specific GEIS Supplement 35 "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Susquehanna Steam Electric Station, Units 1 and 2, Draft Report for Comment," on April 2008. The final, plant-specific GEIS Supplement 35, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Susquehanna Steam Electric Station, Units 1 and 2, Final Report," is scheduled to be issued in April 2009.

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 adverse aging effects on plant systems and components are managed during the period of initial license and that the scope of the review did not allow sufficient credit for management programs, particularly the implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," which regulates management of plant-aging phenomena. As a result of this finding, the staff amended 10 CFR Part 54 in 1995. As published May 8, 1995, in 60 FR 22461, amended 10 CFR Part 54 establishes a regulatory process that is simpler, more stable, and more predictable than the previous 10 CFR Part 54. In particular, as amended, 10 CFR Part 54 focuses on the management of adverse aging effects rather than on the identification of age-related degradation unique to license renewal. The staff made these rule changes to ensure that important systems, structures, and components (SSCs) will continue to perform their intended functions during the period of extended operation. In addition, the amended 10 CFR Part 54 clarifies and simplifies the integrated plant assessment process to be consistent with the revised focus on passive, long-lived structures and components (SCs).

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

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

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

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

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

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

1.2.2 Environmental Review

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

In accordance with the National Environmental Policy Act of 1969 and 10 CFR Part 51, the staff reviewed the plant-specific environmental impacts of license renewal, including whether there was new and significant information not considered in the GEIS. As part of its scoping process, the staff held a public meeting on November 15, 2006, in Berwick, PA, to identify plant-specific environmental issues. The draft, plant-specific GEIS Supplement 35 documents the results of the environmental review and makes a preliminary recommendation as to the license renewal action. The staff held another public meeting on May 28, 2008, in Berwick, PA, to discuss draft, plant-specific GEIS Supplement 35. After considering comments on the draft, the staff will published the final, plant-specific GEIS Supplement 35 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 a license renewal applicant to submit general information, which the applicant provided in LRA Section 1. The staff reviewed LRA Section 1 and finds that the applicant has submitted the required information.

Pursuant to 10 CFR 54.19(b), the NRC requires that the LRA include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." On this issue, the applicant stated in the LRA:

> The current indemnity agreement (No. B-90) for SSES states, in Article VII, that 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. 3, lists SSES operating licenses NPF-14 and NPF-22. PPL Susquehanna, LLC requests that conforming changes be made to Article VII of the indemnity agreement, and Item 3 of the Attachment to that agreement, specifying the extension of agreement to the expiration date of the renewed SSES facility operating licenses sought in this application. In addition, should the license numbers be changed upon issuance of the renewal license, PPL Susquehanna, LLC requests that conforming changes be made to Item 3 of the Attachment to the indemnity agreement, and to other sections of the agreement as deemed appropriate.

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

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

Pursuant to 10 CFR 54.21(b), the NRC requires that, each year following submission of the LRA and at least three months before the scheduled completion of the staff's review, the applicant submit an LRA amendment identifying any CLB changes to the facility that affect the contents of the LRA, including the UFSAR supplement. By letters dated September 12, 2007 and September 26, 2008, the applicant submitted an LRA update which summarize the CLB changes that have occurred during the staff's review of the LRA. This submission satisfies 10 CFR 54.21(b) requirements and is still under staff review.

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

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

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

1.4 Interim Staff Guidance

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

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

Table 1.4-1 Current Interim Staff Guidance

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

ISG Issue (Approved ISG Number)	Purpose	SER Section
Staff Guidance Regarding the Station Blackout Rule (10 CFR 50.63) Associated with License Renewal Applications (LR-ISG-2008-01)	To clarify the scoping boundary of the offsite recovery paths that must be included within the scope of license renewal for station blackout. The staff has issued the proposed ISG for public comments. A final ISG has not yet been issued.	2.5.1.2
Changes to Generic Aging Lesson Learned (GALL) Report Aging Management Program (AMP) XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" (LR-ISG-2007-02)	To address the frequency of inspection of electrical cable connections not subject to 10 CFR 50.49 prior to the period of extended operation. The staff has issued the proposed ISG for public comments. A final ISG has not yet been issued.	3.0.3.1.27

1.5 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 FSAR update required by 10 CFR 50.71(e) following the issuance of the renewed licenses.

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.

SECTION 2

STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 Scoping and Screening Methodology

2.1.1 Introduction

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

In license renewal application (LRA) Section 2.1, “Scoping and Screening Methodology,” the applicant described the scoping and screening methodology used to identify the SSCs at the Susquehanna Steam Electric Station (SSES) that are within the scope of license renewal and the SCs subject to an AMR. The staff reviewed the Pennsylvania Power and Light (PPL) Susquehanna, LLC (the applicant), scoping and screening methodology to determine if it is consistent with the scoping requirements stated in 10 CFR 54.4(a) and the screening requirements stated in 10 CFR 54.21.

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

2.1.2 Summary of Technical Information in the Application

In LRA Sections 2.0 and 3.0, the applicant provided the technical information required by 10 CFR 54.21(a). In LRA Section 2.1, the applicant described the process used to identify the SSCs that meet the license renewal scoping criteria pursuant to 10 CFR 54.4(a), and the process used to identify the SCs that are subject to an AMR, in accordance with 10 CFR 54.21(a)(1). The applicant provided the results of the process used for identifying the SCs subject to an AMR 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”

In LRA Section 3.0, “Aging Management Review Results,” the applicant described its aging management results as follows:

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

In LRA Section 4.0, “Time-Limited Aging Analyses,” the applicant described its identification and 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 contained in NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Revision 1, Section 2.1, “Scoping and Screening Methodology” (SRP-LR). The following regulations form the basis for the acceptance criteria for the scoping and screening methodology review:

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

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

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

In addition, the staff conducted a scoping and screening methodology audit at SSES, located outside Berwick, Pennsylvania, during the week December 11-15, 2006. The audit focused on ensuring that the applicant had developed and implemented adequate guidance to conduct the scoping and screening of SSCs in accordance with the methodologies described in the LRA and the requirements of the Rule. The staff reviewed implementation of the project level guidelines and topical reports describing the applicant’s scoping and screening methodology. Also, the staff conducted detailed discussions with the applicant on the implementation and control of the license renewal program and reviewed administrative control documentation and selected design documentation used by the applicant during the scoping and screening process. The staff also reviewed training for personnel that developed the LRA and quality practices used by the applicant to develop the LRA. Further, the staff evaluated the quality attributes of the applicant's Aging Management Program (AMP) activities described in LRA Appendix A, "Final Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs." The staff also reviewed the training and qualification of the applicant's LRA development team. The staff reviewed scoping and screening results reports for the main steam (MS) system and the turbine building (TB) to ensure that the applicant had appropriately implemented the methodology outlined in the administrative controls and that the results were consistent with the current licensing basis (CLB) documentation.

2.1.3.1 Implementation Procedures and Documentation Sources for Scoping and Screening

The staff reviewed the applicant's scoping and screening implementing procedures as documented in the audit report, dated May 24, 2007, to verify that the process used to identify structure and component (SC)s subject to an AMR was consistent with the in information contained in the LRA and the SRP-LR. Additionally, the staff reviewed the scope of CLB documentation sources and the process used by the applicant to ensure that CLB commitments were appropriately considered and that the applicant adequately implemented 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, "Scoping and Screening Methodology," the applicant reviewed the following information sources during the license renewal scoping and screening process:

- Maintenance Rule Data Base
- Updated Final Safety Analysis Report (UFSAR)
- Design basis references
- Piping & Instrumentation Diagrams (P&IDs)
- Electrical drawings
- Docketed correspondence
- Technical Specifications (TSs) and Bases
- Technical Requirements Manual
- Individual Plant Examination (IPE)
- Individual Plant Examination of External Events (IPEEE)

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

2.1.3.1.2 Staff Evaluation

Scoping and Screening Implementing Procedures. The staff reviewed the applicant's scoping and screening methodology implementing procedures, including license renewal guidelines, documents, reports, and AMR reports, as documented in the audit report, to ensure the guidance was consistent with the requirements of the Rule, the SRP-LR, and NEI 95-10, “Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule,” Revision 6. The staff found the overall process to implement the 10 CFR Part 54 requirements described in the implementing documents and AMRs was consistent with the Rule, SRP-LR and industry guidance. Guidance for determining plant SSCs within the scope of the Rule, including determining which component types of the SCs within the scope of license renewal were subject to an AMR, were contained in the implementing documents. During the review of the implementing documents, the staff focused on the consistency of the detailed procedural guidance with information in the LRA, including the implementation of staff positions documented in the SRP-LR, and information in the staff’s request for addition information (RAI) responses dated April 17, 2007.

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

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

During the audit, the staff reviewed pertinent information sources utilized by the applicant that included the UFSAR, license renewal boundary diagrams, and maintenance rule information. In addition, the applicant’s license renewal process identified additional potential sources of plant information pertinent to the scoping and screening process, including, design basis references, P&IDs, electrical drawings, docketed correspondence, TSs and bases, the fire hazards analysis, safety evaluations, and design documentation such as engineering calculations and design specifications. The staff verified that the applicant’s detailed license renewal program guidelines required use of the CLB source information in developing scoping evaluations.

The SSES 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 SSES component database safety classification data. These controls are described and implementation is governed by plant administrative procedures. Based on a review of the administrative controls, and a sample of the SSES component database safety classifications, the staff concluded that the applicant has established adequate measures to control the integrity and reliability of SSES component database safety classification data and; therefore, concluded that the SSES component database provided a sufficiently controlled source of component data to support scoping and screening evaluations.

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

2.1.3.1.3 Conclusion

On the basis of its review of information in LRA Section 2.1, a review of the applicant's detailed scoping and screening implementing procedures; and the results from the scoping and screening audit, the staff concludes that the applicant's scoping and screening methodology considered CLB information, consistent with the guidance contained in the SRP-LR and NEI 95-10, and met the requirements of 10 CFR 54.4, and is therefore acceptable.

2.1.3.2 Quality Controls Applied to LRA Development

2.1.3.2.1 Staff Evaluation

The staff reviewed the applicant's quality controls to ensure that scoping and screening methodologies used in the LRA were adequately implemented. The staff found that the applicant applied the following quality assurance (QA) processes during LRA development:

- The applicant developed a project plan which was the QA guide implemented for preparation of the LRA.
- Implementation of the scoping and screening methodology was governed by written procedures. A tracking system was implemented to account for the dates that procedures were originally issued and for subsequent revisions.
- The applicant reviewed previous staff RAIs to ensure that applicable issues were addressed in the LRA.
- The SSES QA Committee performed an independent assessment of the LRA to verify that it was developed in accordance with the requirements of 10 CFR Part 54.
- The LRA was subjected to a peer review prior to submittal to the staff.
- The LRA was reviewed by the Off-Site Review Committees prior to submittal to the staff.

2.1.3.2.2 Conclusion

On the basis of its review of information in LRA Section 2.1 and discussion with the applicant's license renewal staff, and a review of quality assessment documents, the staff concludes that the QA activities meet current regulatory requirements and provide assurance that LRA development activities were consistently performed with the applicant's license renewal program requirements.

2.1.3.3 Training

2.1.3.3.1 Staff Evaluation

The staff reviewed the applicant's training process to ensure the guidelines and methodology for the scoping and screening activities were applied in a consistent and appropriate manner. The license renewal project plan included the training requirements for the personnel who developed the LRA and indicated the level of training appropriate to the license renewal task being performed.

Training was required for the license renewal project personnel that included the contract personnel who prepared the application and the applicant's personnel who reviewed the application. The training was designed to vary depending on the level of the person's involvement and responsibility. As described above, the applicant's training guidelines specified the level of training required for the various groups participating in development of the LRA. The training consisted of a combination of reading and attending training sessions and was documented on a qualification card. All license renewal personnel were required to review applicable license renewal regulations, NEI 95-10 and associated procedures. The training also included initial training for the applicant's personnel and the contract personnel for project definition activities, process training for production of documents, subsequent training to the applicant's personnel to review the deliverables, and general training for the applicant's management and plant operations review committee and others involved in the development of the LRA. In addition, the applicant held periodic production meetings in which the license renewal project team members shared their knowledge and experience of a given subject with the team. Training material was developed to include lessons learned during the development of the SSES LRA and previous license renewal projects. The staff reviewed completed qualification and training records of several of the applicant's license renewal personnel and also reviewed completed check lists.

2.1.3.3.2 Conclusion

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

2.1.3.4 Conclusion of Scoping and Screening Program Review

On the basis of its review of information provided by the applicant in LRA Section 2.1, a review of the applicant's detailed scoping and screening implementing procedures, discussions with the applicant's license renewal personnel and the results from the scoping and screening audit, the staff concludes that the applicant's scoping and screening program is consistent with the guidance contained in the SRP-LR and; therefore, is acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

In LRA Section 2.1, the applicant described the methodology used to scope SSCs pursuant to the requirements of the 10 CFR 54.4(a) scoping criteria. The applicant described the scoping process for the plant in terms of systems and structures. Specifically, the scoping process consisted of developing a list of plant systems and structures, identifying their intended functions, and determining which functions meet one or more of the three criteria of 10 CFR 54.4(a). The systems list was developed from the SSES Maintenance Rule Database and confirmed using the Nuclear Information Management System database and the FSAR. The structures list was reviewed against site civil/structural and plant layout drawings. The license renewal evaluation boundaries include those portions of the SSCs that are necessary to ensure that the intended functions will be performed. Structures and components needed to support each of the system and/or structure-level intended functions identified in the scoping process are included within the evaluation boundary. The applicant's scoping methodology, as described in the LRA, is discussed in the sections below.

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

2.1.4.1.1 Summary of Technical Information in the Application

LRA Section 2.1.1.1, "Safety-Related Scoping," describes the scoping methodology as it relates to the safety-related requirements of 54.4(a)(1). With respect to the safety-related criterion, the applicant stated that the safety-related systems and structures are initially identified based on a review of the Maintenance Rule Database, then confirmed using Nuclear Information Management System and the FSAR, system design-basis documents (DBDs), P&IDs, and SSES design standards. Systems and structures whose intended functions met one or more of the requirements of 10 CFR 54.4(a)(1) were included within the scope of license renewal. The staff confirmed that all plant conditions, including conditions of normal operation, design-basis accidents (DBAs), external events, and natural phenomena for which the plant must be designed, were considered for license renewal scoping in accordance with 10 CFR 54.4(a)(1) criteria.

2.1.4.1.2 Staff Evaluation

Pursuant to 10 CFR 54.4(a)(1), the applicant must consider all safety-related SSCs relied upon to remain functional during and following a design-basis event (DBE) to ensure the following functions: (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 capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 50.67(b)(2), or 100.11.

With regard 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).

During the audit, the applicant stated that it evaluated the types of events listed in NEI 95-10 (*i.e.*, anticipated operational occurrences, DBAs, external events and natural phenomena) that were applicable to SSES. The applicant identified the documents that described the events, all of which are contained in the UFSAR, with the exception of fire, which is contained in separate documentation. The applicant also reviewed the IPE and the IPEEE, as well as licensing correspondence and DBDs. The applicant stated that as a result of this review, no additional systems were identified and included within the scope license renewal. The staff concludes that the applicant's evaluation of DBEs was consistent with the guidance contained in the SRP-LR.

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

Specifically, the staff reviewed a sample of the license renewal scoping results for the MS system, the engineered safeguards (ES) service water pumphouse, and the TB to provide additional assurance that the applicant adequately implemented its scoping methodology in accordance with 10 CFR 54.4(a)(1). The staff verified that the scoping results for each of the sampled systems were developed consistent with the methodology, the SSCs credited for performing intended functions were identified, and the basis for the results as well as the intended functions were adequately described. The staff verified that the applicant had identified and used pertinent engineering and licensing information to identify the SSCs required to be within scope, in accordance with 10 CFR 54.4(a)(1).

The staff reviewed the applicant's evaluation of the Rule and CLB definitions pertaining to 10 CFR 54.4(a)(1). The SSES CLB definition of safety-related is not identical to the definition provided in the Rule. The applicant's definition of safety-related and exceptions to the definition in the Rule are documented in LRA Section 2.1.1.1. Based on its review, the staff confirms that 10 CFR 50.34(a)(1) is not applicable to SSES as this regulation pertains to applications for a construction permit and 10 CFR 50. 67(b)(2) is applicable to plants using an alternate source term. The staff noted that SSES has submitted a license amendment request, to the staff, (which was issued by letter dated January 31, 2007) to allow the use of an alternative source term for accident analyses in accordance with the requirements of 10 CFR 50.67(b)(2) and has conservatively included all SSCs which would be affected by the license amendment within the scope of license renewal. In addition, the applicant stated that certain components located in the TB do not have an intended function but are classified by SSES as safety-related and included within the scope of license renewal, in accordance with 10 CFR 54.4(a)(1). However, the staff notes that this process is not articulated by the applicant in the LRA nor is it documented in the license renewal procedures or guidelines. The staff's review of LRA Section 2.1.1 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening methodology.

In RAI 2.1-1, dated March 9, 2007, the staff requested that the applicant provide a written evaluation that addresses the impact, if any, of the use of differing definitions of safety-related and of not having explicitly considered in its scoping methodology for SSES, those structures, systems, or components that are relied upon to ensure "the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines in 10 CFR 50.34(a)(1), 50.67(b)(2), or 100.11 of this chapter, as applicable," consistent with the CLB for SSES.

In the response to RAI 2.1-1, dated April 17, 2007, the applicant stated that the SSES source documents used for 10 CFR 54.4(a)(1) scoping include differing definitions of safety-related pertaining to the offsite exposure limits of 10 CFR 50.34(a)(1), 50.67(b)(2), and 100.11. The offsite exposure criterion is included in the safety-related definition used in each of the source documents, but refers only to the limits of 10 CFR Part 100. The applicant stated that 10 CFR 50.34(a)(1) is associated with facilities seeking a construction permit and therefore is not applicable to SSES license renewal and the dose guidelines of 10 CFR 50.67(b) are associated with accident source term limits which were not applicable to SSES, when the LRA was submitted. The applicant evaluated the variations in the safety-related definitions and concluded that there is no impact on the 10 CFR 54.4(a)(1) scoping performed for the LRA.

Based on its review, the staff finds the applicant's response to RAI 2.1-1 acceptable because the applicant has adequately evaluated the differing definitions of safety-related contained in its scoping source documents pertaining to the offsite exposure criterion. The staff concludes that there was no impact on the applicant's ability to accurately identify SSCs within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(1). Therefore, the staff's concern described in RAI 2.1-1 is resolved.

In RAI 2.1-2, dated March 9, 2007, the staff requested that the applicant discuss the process and rationale by which it determined that certain nonsafety-related components were within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). In addition, the staff requested that the applicant discuss how it reviewed other nonsafety-related SSCS for potential interaction (10 CFR 54.4(a)(2)) with the nonsafety-related components located within the TB, which have been included within the scope of license renewal pursuant to 10 CFR 54.4(a)(1).

In the response to RAI 2.2-2, dated April 17, 2007, the applicant stated that the SSES design bases states that not all equipment designated as "Q"-class, performs a safety-related function. PPL Design Standard GDS-06 states that "Q" items are either safety-related or are to be "treated as safety-related" under the Operational QA Program, even though they do not perform or prevent the performance of the safety-related function. To maintain consistency with normal plant practices, the set of SSCs that satisfy the 10 CFR 54.4(a)(1) criteria conservatively includes those components designated as "Q" that are "treated as safety-related", without performing a safety-related function. Although, certain pressure switches located in the TB are designated "Q" in accordance with normal plant operations and were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1), the component's do not have a safety-related function. The SSES CLB indicates that there are no components that perform a safety-related function located in the TB. Because the CLB establishes that there is no safety-related equipment in the TB, there would be no potential interaction (10 CFR 54.4(a)(2)) with the nonsafety-related components located within the TB.

Based on its review, the staff finds the applicant's response to RAI 2.1-1 acceptable because the applicant has provided a rationale for including the nonsafety-related SCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(1), as consistent with normal plant operations. The staff determines that there are no safety-related SSCs within the TB such that there can be no potential nonsafety-related affecting safety-related interactions. Therefore, the staff's concern described in RAI 2.1-2 is resolved.

2.1.4.1.3 Conclusion

On the basis of its review of sample systems, discussions with the applicant, and review of the applicant's scoping process, the staff concludes that the applicant's methodology for identifying systems and structures is consistent with the scoping criteria pursuant to 10 CFR 54.4(a)(1) and; therefore, is acceptable.

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

2.1.4.2.1 Summary of Technical Information in the Application

In LRA Section 2.1.1.2, "Nonsafety-Related SSCs Affecting Safety-Related SSCs Scoping," the applicant described the scoping methodology as it related to the nonsafety-related criteria in accordance with 10 CFR 54.4(a)(2). Also, the applicant's (a)(2) scoping methodology was based on guidance provided in Appendix F of NEI 95-10, Revision 6. The applicant evaluated the impacts of nonsafety-related SSCs that met 10 CFR 54.4(a)(2) criteria by using two major categories: 1) functional failure, and 2) physical failure. A summary description of these two categories is provided below.

Functional Failure of Nonsafety-Related SSCs. LRA Section 2.1.1.2.1, "Functional Failures of Nonsafety-Related SSC," stated that SSCs required to perform a function in support of safety-related components are classified as safety-related and are included in the scope of license renewal in accordance with 10CFR 54.4(a)(1). SSCs required to remain functional in support of safety-related components were included within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(2). Engineering and licensing documents were reviewed to determine the appropriate systems and structures in this category. The applicable sections of the FSAR, Maintenance Rule Database, and design basis references provide the system and structure functional information to address these considerations. Systems, structures, and components that perform nonsafety-related intended functions credited in the current licensing basis and are subject to an AMR are identified in Sections 2.3, 2.4, and 2.5 of the LRA. In addition, nonsafety-related SSCs identified in the SSES alternate source term analyses have been included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

Nonsafety-Related SSCs with the potential for spatial Interaction with Safety-Related SSCs. LRA Section 2.1.1.2.2, "Spatial Failures of Nonsafety-Related SSCs," states that nonsafety-related systems and nonsafety-related portions of safety-related systems are identified as in-scope under 10 CFR 54.4(a)(2) if there is a potential for spatial interactions with safety-related equipment. Spatial failures are defined as failures of nonsafety-related SSCs that are connected to or located in the vicinity (same building) of safety-related SSCs creating the potential for interaction between the SSCs due to physical impact, harsh environment, flooding, spray or leakage that could impede or prevent the accomplishment of the safety-related functions of a safety-related SSC.

Certain mitigative features, such as missile barriers, flood barriers, and spray shields, are credited in the current licensing basis for the protection of safety-related SSCs from spatial interaction. These protective features are included within the scope of license renewal and evaluated as structural components.

In addition, SSES used the preventive option described in Appendix F of NEI 95-10 to determine the scope of license renewal with respect to the protection of safety-related SSCs from spatial interactions that are not addressed in the current licensing basis. This scoping process required an evaluation based on equipment location and the related SSCs and whether fluid-filled system components are located in the same building or miscellaneous area as safety-related equipment, unless justification is provided that failures would not impact a safety function. Consistent with the related industry discussions in NEI 95-10, Appendix F, failure of nonsafety-related components that do not contain a fluid would not result in spatial interaction as there is no fluid to leak or spray onto safety-related SSCs and system pressure is such that there is no force that could cause significant movement of the failed component. This conclusion is confirmed by review of SSES and industry operating experience.

Nonsafety-Related SSCs directly connected to Safety-Related SSCs. The LRA stated that for nonsafety-related piping that is directly connected to safety-related piping, the seismic Category I design requirements are extended to the first seismic restraint beyond the defined boundaries (the nonsafety-related and safety-related interface). The seismic design is extended to the first point in the system which can be treated as an anchor to the plant structure. An anchor support is defined in SSES piping design specifications as a rigid support that restrains all 6 degrees of motion of the piping system. Anchors can include large fixed equipment such as pumps, tanks, heat exchangers, and in some cases, larger piping. The nonsafety-related structural components in the scope of license renewal include those that comprise seismic anchors. All seismic anchors and the associated piping and components for nonsafety-related to safety-related interfaces are within the scope of license renewal under 10 CFR 54.4(a)(2) using the base-mounted equipment and flexible connection options from NEI 95-10 (Reference 2.1-1), Appendix F, as well as including the entire length of piping that is connected on both ends to safety-related piping.

2.1.4.2.2 Staff Evaluation

Pursuant to 10 CFR 54.4(a)(2), the applicant must consider all nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of safety-related SSCs relied upon to remain functional during and following a DBE to ensure the following functions: (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 capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 50.67(b)(2), or 100.11.

Regulatory Guide (RG) 1.188, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses,” Revision 1, dated September 2005, provided staff endorsement on the use of NEI 95-10, “Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule,” Revision 6, dated June 2005. RG 1.188 states that NEI 95 -10, Revision 6, provides methods that the staff considers acceptable for compliance with 10 CFR Part 54, when preparing a license renewal application. NEI 95 -10, Revision 6, discusses the staff position on 10 CFR 54.4(a)(2) scoping criteria; nonsafety-related SSCs, typically identified in the CLB; consideration of missiles, cranes, flooding, high-energy line breaks (HELBs); nonsafety-related SSCs connected to safety-related SSCs; nonsafety-related SSCs in proximity of safety-related SSCs; and the mitigative and preventative options related to nonsafety-related and safety-related SSCs interactions.

In addition, the staff position on NEI 95-10, Revision 6, states that applicants should not consider hypothetical failures, but rather, should base their evaluation on the plant's CLB, engineering judgment and analyses, and relevant operating experience. The paper further describes operating experience as all documented plant-specific and industry-wide experience that can be used to determine the plausibility of a failure. Documentation would include NRC generic communications and event reports, plant-specific condition reports, industry reports such as safety operational event reports, and engineering evaluations.

The staff reviewed LRA Section 2.1.1.2, where the applicant described its scoping methodology as it related to the nonsafety-related criteria in accordance with 10 CFR 54.4(a)(2). In addition, the staff reviewed the applicant's 10 CFR 54(a)(2) AMR report. The staff noted that the applicant's evaluations were performed in accordance with the guidance contained in NEI 95-10, Revision 6, for identification and treatment of SSCs which meet 10 CFR 54.4(a)(2) criteria. Also, as described in LRA Section 2.1.4.2.1, the applicant's evaluation of the nonsafety-related SSCs to meet 10 CFR 54.4(a)(2) criteria is based on categories of functional failure and physical failure.

Based on its review of the information provided by the applicant in the LRA, 10 CFR 54.4(a)(2) AMR report criteria, and the discussions with the applicant during the audit, the staff's evaluation pertaining to the categories described in paragraph two of this subsection immediately follows.

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

<u>Nonsafety-Related SSCs Directly Connected to Safety-Related SSC</u>s. In order to identify the nonsafety-related SSCs directly connected to safety-related SSCs and required to be structurally sound to maintain the integrity of the safety-related SSCs, the applicant used a bounding approach as described in NEI 95-10, Appendix F and the SSES seismic analysis. The applicant reviewed each mechanical system safety-related to nonsafety-related interface to identify the components located between the interface and the structural boundary or equivalent anchor, if used. The applicant included all nonsafety-related SSCs within the analyzed structural boundary and within the scope of license renewal, in accordance with 10 CFR 54.4(a)(2). If the structural boundary was not indicated on the applicable drawing, the applicant identified the portion of the nonsafety-related SSCs beyond the safety-related SSCs, to the first equivalent anchor or seismic anchor, and included this portion of the nonsafety-related SSCs within the scope of license renewal.

The applicant also indicated in the LRA that if the structural boundary could not be identified for the applicable nonsafety-related/safety-related interface, the nonsafety-related SSCs were included to a point beyond the nonsafety-related/safety-related interface to a base-mounted component, flexible connection, or the end of the piping run. The applicant based its actions on the guidance of NEI 95-10, Appendix F, which describes the use of "bounding criteria" as a method of determining the portion of nonsafety-related SSCs to be included within the scope of license renewal. This provided assurance that the nonsafety-related piping systems included in the design-basis seismic analysis are included in the scope of license renewal. The applicant's identification of these nonsafety-related systems and components at nonsafety-related to safety-related boundary is depicted in its 10 CFR 54.4(a)(2) AMR report. Also listed in this report are the AMR results of the component types with the corresponding intended function, material, environment, and aging effects and associated programs. In addition, the staff noted that the applicant stated in LRA Sections 2.3.3.2, 2.3.3.5, 2.3.3.9, 2.3.3.23, and 2.3.3.31, certain components (*e.g.*, accumulator, tank, heating and ventilation units) perform an anchor function, but are not subject to an AMR based on evaluation of their construction, mounting and support function.

The staff's review of LRA Section 2.1.1.2.2 identified that the applicant had not included nonsafety-related piping attached to safety-related SSCs located within containment or nonsafety-related piping attached to safety-related piping at containment penetrations within the scope of license renewal. In addition, the applicant used an analysis, in lieu of it's documented screening process, to determine whether nonsafety-related components affecting safety-related components, as discussed in LRA Sections 2.3.3.2, 2.3.3.5, 2.3.3.9, 2.3.3.23 and 2.3.3.31, were subject to an AMR. The staff determined that additional information would be required to complete the review of the applicant's scoping methodology.

In RAI 2.1-3, dated March 9, 2007, the staff requested that the applicant explain the following:

(a) The rationale and basis for not including nonsafety-related piping attached to safety-related piping at containment penetrations and extending outside of containment, within the scope of license renewal

(b) The rationale and basis for not including nonsafety-related piping attached to safety-related SCs inside containment, within the scope of license renewal

(c) The rationale for the use of an analysis to determine that nonsafety-related SCs within the scope of license renewal were not subject to an AMR, the details and results of the analysis, and to indicate how the applicant's analysis met the criteria of the screening process used for other nonsafety-related SCs and the requirements of 10 CFR 54.21

In its response to RAI 2.1-3, dated April 17, 2007, the applicant stated:

(a) The applicant had performed a re-evaluation and determined that certain nonsafety-related components attached to safety-related piping at containment penetrations and extending outside of containment, had not been included within the scope of license renewal. The applicant indicated that the nonsafety-related components are connected to, and provide support for, the attached safety-related equipment and have subsequently been included within the scope of license renewal as required by 10 CFR 54.4(a)(2). The applicant provided a list of the nonsafety related equipment which had been included within the scope of license renewal and the results of the aging management reviews.

(b) The applicant had performed a re-evaluation which identified nonsafety-related equipment, inside primary containment, that is connected to safety-related equipment and provides the anchor for the safety-related equipment, that had not been included within the scope of license renewal. The applicant indicated that the nonsafety-related equipment has subsequently been included within the scope of license renewal as required by 10 CFR 54.4(a)(2). The applicant provided a list of the nonsafety-related equipment which had been included within the scope of license renewal and the results of the aging management reviews.

(c) The applicant had determined that certain nonsafety-related components attached to safety-related SSCs and which had been included within the scope of license renewal, had not been subject to an aging management review. The applicant performed an evaluation to determine the extent of condition and subsequently performed the required aging management reviews. The applicant provided a list of the components determined to be subject to an aging management review and the results of the aging management reviews.

Based on its review, the staff finds the applicant=s response to RAI 2.1-3 acceptable because the applicant had performed evaluations to determine if nonsafety-related SCs should be included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) and if aging management reviews were required. The applicant's evaluations, as documented in the RAI response, resulted in (1) the inclusion of nonsafety-related components, attached to safety-related piping at containment penetrations and extending outside of containment within the scope of license renewal; (2) the inclusion of nonsafety-related equipment, inside primary containment, that is connected to safety-related equipment and provides the anchor for the safety-related equipment within the scope of license renewal; and (3) the performance of aging management reviews of nonsafety-related components attached to safety-related SSCs and which had been included within the scope of license renewal, but which had not been previously subject to an aging management review. The staff determined that the nonsafety-related components, discussed in RAI 2.1-3, has been appropriately evaluated for inclusion within the scope of license renewal and subjected to aging management review and that the staff's concern in RAI 2.1-3 is resolved.

Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs. The applicant considered physical impact (*i.e*, pipe whip, jet impingement), harsh environments, flooding, spray, and leakage when evaluating the potential for spatial interactions between nonsafety-related systems and safety-related SSCs. The applicant used a spaces approach for scoping of nonsafety-related systems with potential spatial interaction with safety-related SSCs. The spaces approach focused on the interaction between nonsafety-related and safety-related SSCs that are located in the same space, which was defined as a building which contains safety-related SSCs. The space was defined such that any potential interaction between nonsafety-related and safety-related SSCs is limited to the space.

Physical Impact or Flooding. The applicant considered situations where nonsafety-related supports for non-seismic (including seismic II/I) piping systems and electrical conduit and cable trays with potential for spatial interaction with safety-related SSCs are included in the scope of license renewal per the Rule and subject to an AMR. These supports and components are addressed in a commodity fashion within civil/structural AMR reports. The applicant's review of earthquake experience identified no occurrence of welded steel pipe segments falling due to a strong motion earthquake. The applicant concluded that as long as the effects of aging on supports for piping systems are managed, falling of piping systems is not credible, except due to flow accelerated corrosion. Furthermore, the piping section itself was determined not to be in-scope for 10 CFR 54.4(a)(2), due to a physical impact hazard. The applicant evaluated whether missiles could be generated from internal or external events such as failure of rotating equipment or overhead-handling systems. The nonsafety-related design features which protect safety-related SSCs from such missiles were included within the scope of license renewal.

Pipe Whip, Jet Impingement, and Harsh Environment. The applicant evaluated nonsafety-related portions of high energy lines against the 10 CFR 54.4(a)(2) criteria. The applicant's evaluation was based on a review of the FSAR and relevant site documentation. The applicant evaluated the high energy systems to ensure proper identification of components that are part of nonsafety-related high energy lines that can effect safety-related equipment. If the applicant's HELB analysis assumed that a nonsafety-related piping system did not fail or assumed failure only at specific locations, then that piping system (*i.e*., piping, equipment and supports) was included within the scope of license renewal pursuant to 10 CFR 54.4(a)(2) criteria and subject to and AMR, in order to provide reasonable assurance that those assumptions remain valid through the period of extended operation. Also, as discussed in the SSES AMR report for 10 CFR 54.4(a)(2) review, the applicant reviewed the reference documents that contained HELB analysis for inside as well as outside containment and identified high energy lines. Many of the identified systems were safety-related and included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The remaining nonsafety-related high energy lines, which were determined to have potential interaction with safety-related SSCs, were included within the scope of license renewal.

Spray and Leakage. The applicant evaluated moderate and low-energy systems which have the potential for spatial interactions of spray and leakage. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for spray or leakage that could prevent safety-related SSCs from performing their required safety function were considered within the scope of license renewal. The applicant used a spaces approach to identify the nonsafety-related SSCs which were located within the same space as safety-related SSCs. As described by the applicant in the LRA, a space is defined as a building containing safety-related SSCs. The space is defined such that any potential interaction between nonsafety-related and safety-related SSCs is limited to the space. The applicant documented its review of each mechanical system for potential spatial interaction with safety-related SSCs in applicant's scoping results AMR review report, which also is documented in the audit report. Following identification of the applicable mechanical systems, the applicant reviewed the system functions to determine whether the system contained fluid, air or gas. Based on the spray or leakage and also operating experience, the applicant excluded the nonsafety-related SSCs containing air or gas from the scope of license renewal. The applicant then reviewed the mechanical systems to determine whether the system had any components located within a structure containing safety-related SSCs. Those nonsafety-related SSCs determined to contain fluid and located within a space containing safety-related SSCs, were included within the scope license renewal.

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

2.1.4.2.3 Conclusion

On the basis of its review of sample systems, discussions with the applicant, and review of the applicant's scoping process, the staff concludes that the applicant's methodology for identifying systems and structures is consistent with the scoping criteria of 10 CFR 54.4(a)(2) and; therefore, is acceptable.

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

2.1.4.3.1 Summary of Technical Information in the Application

In LRA Section 2.1.1.3, "Regulated Events Scoping," the applicant described the methodology for identifying systems and structures that are in the scope of license renewal based on the regulated events criteria. The SSCs that perform intended functions required for compliance with a regulated event and subject to an AMR are identified in LRA Sections 2.3, 2.4, and 2.5. Mechanical and structural systems that perform a fire protection, anticipated transients without scram (ATWS), and/or station blackout (SBO) intended function are included in the scope of license renewal. All plant electrical and instrumentation and control (I&C) systems and electrical equipment in mechanical systems were included in-scope of license renewal.

<u>Fire Protection</u>. In LRA Section 2.1.1.3.1, "Fire Protection (10 CFR 50.48)," the applicant described the scoping of mechanical systems and structures required to demonstrate compliance with the fire protection requirements. In the LRA, the applicant stated that the SSES was licensed after January 1, 1979 and is therefore not bound to the provisions of 10 CFR 50.48(b). However, as a result of licensing commitments and standard fire protection licensing condition for plants licensed after January 1, 1979, the SSES generated a Fire Protection Review Report which addresses compliance with pertinent regulations. The applicant's CLB includes the Fire Protection Review Report, which contains a safe-shutdown analysis (to demonstrate compliance with Appendix R), description of the fire protection system, the fire hazard analysis (to demonstrate that a single postulated fire will not affect the ability of both units to be brought to and maintained in cold shutdown condition), and any deviation requirements. Section 2.1.1.3.1 further states, based on its review of its CLB for fire protection, the applicant identified systems and structures and determined the corresponding intended functions that meet the requirements of 10 CFR 50.48 in addition to 10 Part 50, Appendix R. This determination included both the features required for fire protection of safety-related equipment and any system function that was included in, or provides necessary support for, one or more of the three safe-shutdown paths credited for compliance with 10 CFR Part 50, Appendix R. Mechanical systems and structures credited with fire prevention, detection, mitigation in areas containing equipment important to safe operation of the plant, and equipment credited with safe-shutdown in the event of a fire were included within the scope of license renewal.

<u>Environmental Qualification (EQ)</u>. The applicant described the EQ requirements of 10 CFR 50.49 in LRA Section 2.1.1.3.2, "Environmental Qualification (10 CFR 50.49)." The electrical equipment at SSES, which is required to be environmentally qualified for a "harsh" environment by 10 CFR 50.49, is identified in the SSES - Nuclear Information Management System database. In the LRA, the applicant stated that EQ at SSES applies to electrical equipment installed in mechanical systems, instruments or valve operators in a fluid system, and also the electrical equipment installed in electrical systems. Electrical equipment that is required to be environmentally qualified is identified to be within the scope of license renewal.

Pressurized Thermal Shock. These requirements are not applicable because SSES units are of boiling-water reactor (BWR) design.

Anticipated Transient Without Scram. The applicant described the scoping of mechanical systems and structures required to demonstrate compliance with the ATWS requirements of 10 CFR 50.62 in LRA Section 2.1.1.3.4, "Anticipated Transients without Scram (10 CFR 50.62)." Mechanical systems and structures that perform a 10 CFR 50.62 intended function were included within the scope of license renewal.

Station Blackout. The applicant described the scoping criteria in LRA Section 2.1.1.3.5, "Station Blackout (10 CFR 50.63)." The applicant's licensing basis requires an SBO coping duration of four hours, and therefore the mechanical systems and structures required to support the four-hour coping duration are included within the scope of license renewal. The applicant stated that, at SSES, all plant equipment which includes systems and instrumentation necessary to cope with the SBO was identified and investigated to assure that all items necessary for the equipment to function would be available for at least four-hours. This is the equipment relied upon for compliance with 10 CFR 50.63 requirements. Also, the applicant stated that based on its CLB for SBO, the intended functions for each system and structure supporting the 10 CFR 50.63 requirements were determined, and the SSCs that perform an intended function for SBO were included in the scope of license renewal.

2.1.4.3.2 Staff Evaluation

The staff reviewed the applicant's approach to identifying the mechanical systems and structures relied upon to perform functions related to regulated events applicable to BWRs in accordance with 10 CFR 54.4(a)(3). As part of this review and during its scoping and screening audit at SSES, the staff discussed the methodology with the applicant, reviewed the documentation developed to support the license renewal, and evaluated a sample of the resultant mechanical systems and structures identified as within scope pursuant to 10 CFR 54.4(a)(3) criteria. The staff's review of the applicant's documentation included, but was not limited to: (a) license renewal project guidelines, (b) license renewal project documents, (c) plant drawings, (d) UFSAR, (e) maintenance rule design basis documentation, and (f) the applicant's Fire Protection Review Report.

The license renewal project guidelines described the applicant's process for identifying systems and structures that are within the scope of license renewal. As described in the license renewal project guidelines, all mechanical systems and structures that perform an intended function pursuant to 10 CFR 54.4(a)(3), were included within the scope of license renewal, and the results of scoping are documented in the applicant's license renewal project document scoping results reports. The license renewal project documents stated that the scope of license renewal includes all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the 10 CFR 54.4(a)(3) regulated events. The staff reviewed the applicant's evaluation of mechanical systems and structures for compliance with the scoping criteria of 10 CFR 54.4(a)(3) and discussed the results of applicant's evaluation with the applicant's license renewal project team members. The staff's review of the applicant's evaluation and results of scoping requirements pursuant to 10 CFR 54.4(a)(3), for each regulated event, is described below.

Fire Protection. As described in the LRA and the license renewal project documents, based on a review of the Fire Protection Review Report for SSES, fire hazards analysis, topical design basis documents, and other CLB documents, the applicant identified systems and structures and determined the corresponding intended functions that meet the requirements of fire protection license renewal scoping requirements of 10 CFR 54.4(a)(3). In a sample review of the applicant's methodology for meeting 10 CFR 54.4(a)(3) regulation for fire protection, the staff verified that the license renewal project document report identified the mechanical systems that are within the scope of license renewal because they perform intended functions pursuant to 10 CFR 50.48. The license renewal project documents summarized the scoping results for mechanical systems and identified several mechanical systems that have one or more intended functions pursuant to 10 CFR 50.48. The staff performed a sample review of the residual heat removal service water (RHRSW) system, core spray system (CSS), and circulating water pump house (CWPH) systems and structure for their inclusion as in-scope for fire protection. Based on its review of the applicant's documentation and discussions with the applicant's license renewal project team members, the staff finds that the applicant has implemented an acceptable method for identifying systems and structures that perform a function that meets the fire protection requirements of 10 CFR 54.4(a)(3) and has included those systems and structures within the scope of license renewal.

<u>Environmental Qualification</u>. During the scoping and screening audit, the staff reviewed the LRA and the applicant=s implementing procedures and results reports (license renewal project documents) for the EQ regulated event. Also, the staff discussed with the applicant's license renewal project team, the details of the applicant's EQ scoping process and the information sources used, to determine compliance with 10 CFR 50.49. The staff confirmed that the applicant=s primary sources of information for scoping electrical components for license renewal was the Nuclear Information Management System database and the CLB, which identified electrical equipment required by 10 CFR 50.49 to be environmentally qualified for harsh environments, and the intended functions of those systems. The staff reviewed selected portions of Nuclear Management System database and the SSCs identified within the scope of license renewal in accordance with 10 CFR 54.4(a)(3). The staff determined that the applicant had appropriately identified SSCs supporting environmental qualification and had accurately identified the intended functions.

<u>Anticipated Transient Without Scram</u>. The three primary systems at SSES, that perform intended functions pursuant to 10 CFR 50.62 to mitigate an ATWS event, are: standby liquid control (SLC), alternate rod insertion, and reactor recirculation pump trip systems. Also, several other SSCs support these systems in performing intended functions in accordance with 10 CFR 50.62. The applicant=s scoping results report identified these mechanical systems as included within the scope of license renewal, because they perform a 10 CFR 50.62 intended function. During the audit, the staff reviewed the applicant=s license renewal implementing procedures and results documents. The staff performed a sample review of the above three systems that perform 10 CFR 50.62 intended functions. The staff also reviewed the primary sources of information that the applicant used for identifying these intended functions. Sources the applicant reviewed for scoping the systems and structures pursuant to 10 CFR 50.62 included topical design basis documents for ATWS, Maintenance Rule Database documentation, the UFSAR, and SERs related to compliance with 10 CFR 50.62. Based on its review of the source documentation and the system functions, the applicant included those SSCs that perform an intended function for ATWS within the scope of license renewal.

<u>Station Blackout</u>. In accordance with the CLB, the coping period for SSES is four hours, during which time, all systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.63 for SBO, be included

within the scope of license renewal. The staff reviewed the LRA, as well as the applicant=s implementing procedures and the results reports in accordance with the criteria found in 10 CFR 50.63 and the applicant=s results report which identified mechanical systems and structures that are included within the scope of license renewal because they perform an intended function pursuant to 10 CFR 50.63. The staff reviewed selected portions of the sources of information used by the applicant for the scoping of systems and structures in compliance with 10 CFR 50.63 including the UFSAR, site technical report for coping assessment for the SSES during an SBO, and site calculations (UFSAR Section 15.8). Based on review of these information sources and the CLB, the staff determined that the applicant had correctly identified the intended functions for each system and structure meeting the requirements of 10 CFR 50.63, had identified the SSCs that perform an intended function for a SBO and included them within the scope of license renewal. .

2.1.4.3.3 Conclusion

On the basis of the sample review, discussions with the applicant, and review of the applicant's scoping process, the staff concludes that the applicant's methodology for identifying systems and structures meets the scoping criteria pursuant to 10 CFR 54.4(a)(3) and; therefore, is acceptable.

2.1.4.4 Plant-Level Scoping of Systems and Structures

2.1.4.4.1 Summary of Technical Information in the Application

System and Structure Level Scoping. The applicant documented its methodology for scoping of SSCs in accordance with 10 CFR 54.4(a) in the license renewal project guidelines and license renewal project documents, as documented in the audit report. The applicant's approach to system and structure scoping provided in the site guidance was consistent with the methodology described in LRA Section 2.1. Specifically, the license renewal project guidelines specified that the personnel performing license renewal scoping use CLB documents and describe the system or structure including a list of functions that the system or structure is required to accomplish. Sources of information regarding the CLB for systems included the Maintenance Rule Database, FSAR, DBDs, P&IDs, electrical drawings, and docketed correspondence. The applicant then compared identified system or structures function lists to the scoping criteria to determine whether the functions met the scoping criteria of 10 CFR 54.4(a). The applicant documented the results of the plant-level scoping process in accordance with the license renewal project guidelines. These results were provided in the systems and structures license renewal project documents. The license renewal project documents contained information including a description of the structure or system, a listing of functions performed by the system or structure, identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system or structure, references, and the basis for the classification of the system or structure intended functions. During the audit, the staff reviewed a sampling of license renewal project document reports and concluded that the applicant's scoping results in the license renewal project documents contained an appropriate level of detail to document the scoping process.

Component Level Scoping. After the applicant identified the intended functions of systems or structures within the scope of license renewal, a review determined which components of each in-scope system and structure support license renewal intended functions. The components that support intended functions were considered within the scope of license renewal and screened to determine whether an AMR was required. The applicant considered three component/commodity groups during this stage of the scoping methodology: (1) mechanical, (2) structural commodity, and (3) electrical commodity.

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

Insulation. LRA Section 2.1.2.6, "Treatment of Insulation," stated that at SSES, piping and equipment insulation is classified as nonsafety-related and is required to maintain its structural integrity for nonsafety affecting safety considerations. Insulating materials that function to limit heat transfer, serve as fire barriers, or are required to maintain their structural integrity are included within the scope of license renewal and are addressed as structural commodities in Section 2.4 of the LRA.

Consumables. LRA Section 2.1.2.4, "Treatment of Consumables," states that the guidance in Section 4.1 of NEI 95-10 was used to categorize and evaluate consumables. Consumables were divided into the following five categories for the purpose of license renewal: (a) packing, gaskets, component seals, and O-rings; (b) structural sealants; (c) oil, grease, and component filters; (d) system filters, fire extinguishers, fire hoses, and air packs; and, (e) mechanical sealants.

Group (a) subcomponents are not relied upon to form a pressure-retaining function and, therefore, are 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 according to plant procedures and, therefore, are not subject to an AMR. Group (d) consumables are subject to replacement based on National Fire Protection Association standards and Department of Transportation standards according to plant procedures and, therefore, are not subject to an AMR. Group (e) mechanical sealants in the heating, ventilation, and air conditioning (HVAC) system include duct tape, and gaskets. Upon evaluation, the applicant determined that these consumables did not have an intended function for license renewal and; therefore, are not subject to an AMR.

2.1.4.4.2 Staff Evaluation

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

2.1.4.4.3 Conclusion

Based on its review of the LRA, scoping and screening implementing procedures, and a sampling of system scoping results during the audit, the staff concludes that the applicant's methodology reasonably identifies SSCs and commodity groups within the scope of license renewal and their intended functions. The staff also concludes that the applicant's scoping methodology for plant SSCs, commodity groups, insulation, and consumables meets the scoping criteria pursuant to 10 CFR 54.4(a)(3) and; therefore, is acceptable.

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 license renewal evaluation boundaries. For mechanical systems, the mechanical components include those portions of the system that are necessary to ensure that the intended functions will be performed. Structures and components needed to support each of the system/structure-level intended functions identified in the scoping process are included within the evaluation boundary.

The evaluation boundaries for mechanical systems are documented on license renewal boundary drawings created by marking mechanical piping and instrumentation diagrams to indicate the components within the scope of license renewal. Components within the evaluation boundary are reviewed to determine whether they perform an intended function. Typically, components in mechanical systems perform a pressure boundary function. Some components may perform other functions such as heat transfer, filtration, or flow control. Intended functions are established based on whether a particular function of a component is necessary to support the system functions that meet the scoping criteria.

2.1.4.5.2 Staff Evaluation

The staff evaluated LRA Section 2.1 and the guidance in license renewal project documents, license renewal project guidelines, and AMR reports to complete the review of mechanical scoping process. The project document and guidelines provided instructions for identifying the evaluation boundary. Determination of the mechanical system evaluation boundary requires an understanding of system operations in support of intended functions. This process was based on review of P&IDs, DBDs, Maintenance Rule basis documents, component databases, and CLB documents such as the Environmental Protection Plan, the UFSAR, the Fire Protection Review Report, the Offsite Dose Calculation Manual, the QA Program Description, the Technical Requirements Manual, and the TSs and Bases. The evaluation boundaries for mechanical systems are documented on license renewal boundary drawings created by marking mechanical piping and instrumentation diagrams to indicate the components within the scope of license renewal.

Components within the evaluation boundary were reviewed to determine whether they perform an intended function. Intended functions are established based on whether a particular function of a component is necessary to support the system functions that meet the scoping criteria. Mechanical components were grouped, where practical, by component type.

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

The staff reviewed the applicant's methodology for identifying main steam (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 has identified and used pertinent engineering and licensing information in order to determine the MS mechanical component types required to be within the scope of license renewal. As part of the review process, the staff evaluated each system intended function identified for the MS system, the basis for inclusion of the intended function, and the process used to identify each of the system component types. The staff verified that the applicant has identified and highlighted system P&IDs to develop the license renewal evaluation boundaries in accordance with the procedural guidance. The applicant was knowledgeable about the process and conventions for establishing boundaries as defined in the license renewal implementing procedures. Additionally, the staff verified that the applicant's results are in accordance with the governing procedures. Specifically, other license renewal personnel knowledgeable about the system had independently reviewed the marked-up drawings to ensure accurate identification of system intended functions. The applicant performed additional cross-discipline verification and independent reviews of the resultant highlighted drawings before final approval of the scoping effort.

2.1.4.5.3 Conclusion

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

2.1.4.6 Structural Component Scoping

2.1.4.6.1 Summary of Technical Information in the Application

In LRA Section 2.1, the applicant described the methodology for identifying structures that are in the scope of license renewal. Initially, all plant structures were reviewed to determine whether they were in-scope for license renewal. The list of structures was identified using CLB documents such as the FSAR, the Maintenance Rule document for structures, the Fire Protection Review Report, topical design basis documents, and plant drawings. Structures that have an intended function for 10 CFR 54.4(a) were included in the scope of license renewal and listed in LRA Table 2.2-3. LRA Section 2.4 described the scoping results for the individual structures that are in-scope of license renewal.

2.1.4.6.2 Staff Evaluation

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

The license renewal project guidelines described the applicant's process for identifying structures that are within the scope of license renewal and stated that all structures that perform an intended function are to be included within the scope of license renewal and that the scoping results are to be documented in the scoping results report. The scoping results report listed all the structures that were evaluated, and also described the procedures the applicant used to identify structures.

The staff reviewed the applicants implementing procedures and scoping results reports. The applicant performed structural scoping in a manner to ensure that all plant buildings, yard structures, and SBO related non-plant structures were considered. The scoping results report identified the intended functions for each structure required for compliance with one or more criteria pursuant to 10 CFR 54.4(a). The structural component intended functions were identified based on the guidance provided in NEI 95-10, and the SRP-LR. For structures, the applicant determined the evaluation boundaries by developing a complete description of each structure with respect to the intended functions performed by the structure. The results of the review were documented in the scoping results report which contained a list of structures, evaluation results for each structure pursuant to 10 CFR 54.4(a) criteria, a description of structural intended functions, and source reference information for the functions. The applicant identified 16 structures and or buildings as within the scope of license renewal.

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 were appropriately implemented and whether the scoping results were consistent with CLB requirements. The staff also reviewed structural scoping evaluation results for the ES service water (SW) pump-house and the TB to verify proper implementation of the scoping process. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.4.6.3 Conclusion

On the basis of the staff's review of information in the LRA, the applicant's detailed scoping procedures, and a sampling review of structural scoping results, the staff concludes that the applicant's methodology for identification of the structures within the scope of license renewal meets the scoping criteria pursuant to 10 CFR 54.4(a) and; therefore, is acceptable.

2.1.4.7 Electrical Scoping

2.1.4.7.1 Summary of Technical Information in the Application

LRA Section 2.1.1.4.3, "Electrical and Instrumentation and Control Systems" and Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Control Systems," describes the scoping process associated with electrical systems and components. A bounding scoping approach was used for electrical equipment. All electrical components were determined to be within the scope of license renewal and subject to an AMR unless they were scoped out at the system level or are screened out at the component level by commodity group. Therefore, detailed evaluation boundaries were not depicted for electrical scoping.

2.1.4.7.2 Staff Evaluation

The staff evaluated LRA sections 2.1.1.4.3 and 2.5 and the applicant's implementing procedures and AMR reports, as documented in the audit report governing the electrical scoping methodology. The applicant reviewed the electrical and I&C systems in accordance with the requirements of 10 CFR 54.4 and determined which systems were to be included within the scope of license renewal. The applicant used the Maintenance Rule Data Base, the FSAR and systems DBDs to determine whether systems met the requirements for inclusion pursuant to 10 CFR 54.4(a)(1), (2) or (3). All electrical components contained in plant systems within the scope of license renewal and non-plant electrical systems, including switchyard components required to support SBO, were included within the scope of license renewal. In addition, the applicant identified 20 fuse boxes as included within the scope of license renewal. The staff reviewed selected portions of the data sources and selected several examples of components including switchyard components required to support SBO and fuse boxes, for which the applicant demonstrated the process used to determine whether electrical components were within the scope of license renewal.

2.1.4.7.3 Conclusion

On the basis of its review of information contained in the LRA, the applicant's scoping implementing procedures, and a sampling review of electrical scoping results, the staff concludes that the applicant's methodology for identification of electrical components within the scope of license renewal meets the scoping criteria pursuant to 10 CFR 54.4(a) and; therefore, is acceptable.

2.1.4.8 Conclusion for Scoping Methodology

On the basis of its review of the LRA and the scoping implementing procedures, the staff determines that the applicant's scoping methodology is consistent with the guidance contained in the SRP-LR. The staff further determines that the applicant has identified those SSCs that are safety-related, whose failure could affect safety-related functions, and are necessary to demonstrate compliance with staff regulations for fire protection, EQ, ATWS, and SBO. The staff concludes that the applicant's methodology is consistent with the requirements of 10 CFR 54.4(a) and; therefore, is acceptable.

2.1.5 Screening Methodology

2.1.5.1 General Screening Methodology

After determining the systems and structures within the scope of license renewal, the applicant implemented a process for determining which SSCs were subject to an AMR, in accordance 10 CFR 54.21.

2.1.5.1.1 Summary of Technical Information in the Application

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

- Identification of components, long-lived or passive, for each in-scope mechanical system, structure and electrical commodity group

- Identification of the license renewal intended function(s) for all mechanical and structural component types and electrical commodity groups

Active components were screened out and therefore, did not require 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. Sealants for structures were the only consumables within the scope of license renewal that require an AMR

2.1.5.1.2 Staff Evaluation

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

The staff reviewed the methodology used by the applicant to determine 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 an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). In LRA Section 2.1.2, the applicant discussed these screening activities as they related to component types and commodity groups within the scope of license renewal.

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

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

2.1.5.1.3 Conclusion

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

2.1.5.2 Mechanical Component Screening

2.1.5.2.1 Summary of Technical Information in the Application

LRA Section 2.1.2.1, "Screening of Mechanical Systems," discusses the screening methodology for identifying passive and long-lived mechanical components and their support structures that are subject to an AMR. License renewal drawings were prepared to indicate portions of systems that support system intended functions within the scope of license renewal (with the exception of those systems in-scope for 10 CFR 54.4(a)(2) for physical interactions, as discussed below).

2.1.5.2.2 Staff Evaluation

The staff evaluated the mechanical screening methodology in LRA 2.1.2.1, the license renewal project documents, license renewal project guidelines, and the AMR reports. The mechanical system screening process began with the results from the scoping process. The applicant reviewed each system evaluation boundary, as illustrated on P&IDs, to identify passive and long-lived components. Within the system evaluation boundaries, all passive, long-lived components that perform or support an intended function are subject to an AMR. To streamline the AMR process, the applicant grouped components into component types. The component types were then reviewed against the list contained in NEI 95-10, Appendix B. The results of the review are documented in the AMR reports. The AMR reports contain system intended functions, system evaluation boundaries, component materials and environments, component intended functions, and AMR results.

The staff reviewed the results of the boundary evaluations and further discussed the process with the applicant. The staff confirmed that mechanical system evaluation boundaries were established for each system within the scope of license renewal. These boundaries were determined by mapping the pressure boundary associated with system-level license renewal intended functions onto the P&IDs. A preparer and an independent reviewer performed a comprehensive evaluation of the boundary drawings to ensure the completeness and accuracy of the review results.

Additionally, the staff reviewed the screening activities associated with the MS system. The staff reviewed the system intended functions and associated source documents identified for the system, the MS flow diagrams, and the associated results documented in the AMR report. The staff did not identify any discrepancies with the evaluation, and determined that the applicant has adequately followed the process documented in the license renewal project documents, and adequately documented the results in the AMR reports.

2.1.5.2.3 Conclusion

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

2.1.5.3 Structural Component Screening

2.1.5.3.1 Summary of Technical Information in the Application

LRA Section 2.1.2.2, “Screening of Structures,” states that for each structure within the scope of license renewal, the screening process identified those structural components that were subject to an AMR. LRA Section 2.4, “Scoping and Screening Results: Structures,” presents the results for structures. The screening process for structural components involved a review of design documents (UFSAR, drawings) to identify the specific structural components that make up the structure. Structural components typically do not have unique identifiers similar to those provided for mechanical components. Therefore, grouping structural components and commodities were first based on materials of construction and then subdivided based on component design and function which provided a means of categorizing them for an AMR. Commodity groups were based on materials of construction, such as steel, concrete, elastomers, or earthen. Once the structural commodity groups were identified within an in-scope structure or building, the commodity groups were subdivided into discrete structural component types based on design, such as walls, floors, fire doors, and equipment supports. Structures contain inherently passive, long-lived structural components and therefore the structural components within the scope of license renewal that perform an intended function were identified as subject to an AMR.

2.1.5.3.2 Staff Evaluation

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

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

The staff reviewed the applicant's methodology used for structural screening described in LRA sections noted above, and in the applicants implementing guidance and AMR reports. The applicant performed the screening review in accordance with the implementation guidance and captured pertinent structure design information, component, materials, environments, and aging effects. The staff confirmed that the applicant used the lists of passive SCs embodied in the regulatory guidance as an initial starting point and supplemented that list with additional items unique to the site or for which a direct match to the generic lists did not exist (*i.e.*, material and/or environment combinations). The boundary for a structure was the entire building including base slabs, foundations, walls, beams, slabs, and steel superstructure. The applicant provided the staff with a detailed discussion that described the screening methodology, as well as the screening reports for a selected group of structures.

The staff conducted detailed discussions with the applicant’s license renewal team and reviewed documentation pertinent to the screening process. The staff assessed whether the screening methodology outlined in the LRA and procedures was appropriately implemented and whether the scoping results were consistent with CLB requirements. The staff also reviewed structural screening results for SCs contained in the ES SW pump-house and the TB to verify proper implementation of the screening process. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.3.3 Conclusion

On the basis of its review of information contained in the LRA, the applicant's detailed screening implementing procedures, and a sampling review of structural screening results, the staff concludes that the applicant's methodology for identification of structural components subject to an AMR met the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.1.5.4 Electrical Component Screening

2.1.5.4.1 Summary of Technical Information in the Application

In the LRA section 2.1.2.3, “Screening of Electrical and Instrumentation and Control Systems,” the applicant discussed the screening of electrical and instrumentation and control system components. For each electrical system within the scope of license renewal, the screening process identified those electrical components and commodities that are subject to an AMR. Electrical components in mechanical systems were included in the scope of license renewal and were addressed under the electrical screening process.

The process of electrical screening differed from the mechanical and structural processes because the electrical components were addressed completely within their respective commodity groups. Each electrical component within the scope of license renewal is assigned to an electrical component commodity group for the screening evaluation. The screening of electrical components for license renewal was performed utilizing a commodity group basis. An electrical commodity group is a group of electrical components grouped by type of equipment and/or function. The listing of electrical component commodity groups included in Appendix B to NEI 95-10 is used as the starting point for establishing commodity groups. Review of SSES documents (FSAR, single-line drawings, and electrical layout drawings) was used to validate the listing as complete.

For the electrical equipment within the scope of license renewal, the passive, long-lived components that perform or support an intended function are subject to an AMR. NEI 95-10, Appendix B, identifies the electrical commodities considered to be passive and potentially requiring an AMR. For SSES, electrical commodity groups were identified and cross-referenced to the appropriate NEI 95-10 commodity, which identifies the passive commodity groups. Electrical commodities determined to be active were not subject to an AMR. Electrical commodities that are not subject to replacement based on a qualified life or specified time period were considered long-lived. Components that are subject to replacement are addressed in replacement programs, such as the Environmental Qualification Program, or other controlled programs that establish a specific service life, qualified life, or replacement frequency. Components that are not long-lived are not subject to an AMR.

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant's methodology used for electrical screening in LRA Section 2.1.2.3 and the applicant's implementation procedures and AMR reports. Based on a review of the LRA, applicant's implementing procedures and screening reports, the staff determined that the applicant used the screening process described in these documents to identify the electrical commodity groups subject to AMR and that the applicant used the component database, the stations single-line drawings, and cable procurement specifications as data sources to identify the electrical and I&C components, including fuses-holders. The applicant determined there were 20 fuse-holders located outside of active devices and subject to an AMR.

The staff determined that the applicant assembled a table of four commodities which were determined to meet the passive criteria which were grouped in accordance with NEI 95-10 as (a) non-insulated cables and connections, (b) non-insulated metal enclosed (phase) bus, (c) high-voltage insulators, and (d) transmission conductors and connections. Based on the review of the applicant's screening reports, the staff determined that the applicant evaluated the identified, passive commodities to determine whether they were subject to replacement based on a qualified life or specified time period (short-lived), or not subject to replacement based on a qualified life or specified time period (long-lived). The remaining passive, long lived components were determined to be subject to an AMR. The staff reviewed the applicant's screening of selected components including switchyard components required to support SBO and fuse boxes, to verify the correct implementation of the methodology.

2.1.5.4.3 Conclusion

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

2.1.5.5 Conclusion for Screening Methodology

On the basis of its review of the LRA, the screening implementing 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 contained in the SRP-LR and that the applicant has identified those passive, long-lived components within the scope of license renewal that are subject to an AMR. The staff concludes that the applicant's methodology is consistent with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.1.6 Summary of Evaluation Findings

The staff review of the information presented in LRA Section 2.1, the supporting information in the scoping and screening implementing procedures and reports, the information presented during the scoping and screening methodology audit, and the applicant's responses to the staff's RAIs dated March 9, 2007, formed the basis of the staff's determination. The staff confirmed that the applicant's scoping and screening methodology is consistent with the requirements of the Rule. From this review, the staff concludes that the applicant's methodology for identifying SSCs within the scope of license renewal and SCs requiring an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.2 <u>Plant-Level Scoping Results</u>

2.2.1 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 verified that the applicant properly implemented its methodology, the staff's review focused on the implementation results shown in LRA Tables 2.2-1, 2.2-2, and 2.2-3, to confirm that there were no omissions of plant-level systems and structures within the scope of license renewal.

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

The staff's review of LRA Section 2.2 identified areas where additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.2-1, dated August 27, 2007, the staff noted that LRA Table 2.2-1 defines the electro-hydraulic control and logic system and the electro-hydraulic control hydraulic power system as not within the scope of license renewal. Electro-hydraulic control systems assist to provide holdup and plate-out of fission products that may leak through the closed main steam isolation valves (MSIVs). This is a function performed by components located in the main condenser and MSIV leakage pathway. In doing so, they fulfill intended functions pursuant to 10 CFR 54.4(a)(2). The staff requested that the applicant provide additional information to justify exclusion of the electro-hydraulic control and logic system and the electro-hydraulic control hydraulic power system from the scope of license renewal.

In its response to RAI 2.2-1, dated October 18, 2007, the applicant stated:

> The Electro-Hydraulic Control and Logic System, and the Electro-Hydraulic Control Hydraulic Power System are not within the scope of license renewal and are not subject to Aging Management Review (AMR). Control of fission products that may leak through a closed MSIV is provided by directing the leakage to the condenser prior to release to atmosphere. This function is performed by the Main Steam System, as discussed in LRA Section 2.3.4.6. The Susquehanna FSAR, Section 6.7 states: "The MSIV leakage Isolated Condenser Treatment Method (ICTM) controls and minimizes the release of fission products which could leak through the closed main steam isolation valves (MSIVs) after a LOCA. The treatment method provides this control by processing MSIV leakage prior to release to the atmosphere. This is accomplished by directing the leakage through the main steam drain line to the condenser." The primary path for the ICTM

method as used at Susquehanna depends on the drain line pathway to the condenser. The primary path is in-scope and subject to AMR and is depicted on LR-M-141/2141-1 and LR-M-205/2105-1. The secondary path depends on the Main Steam line drip legs, is in-scope and subject to AMR, and is depicted on LR-M-101/2101-1. The ICTM does not depend on either the Electro-Hydraulic Control and Logic System, or the Electro-Hydraulic Control Hydraulic Power System to maintain any valves open to provide the pathway from the MSIVs to the condenser for either the primary or the secondary paths.

Per FSAR Section 6.7.2.1.1, the primary pathway to the condenser is the main steam drain line through the HV-1(2)41F020 and HV-1(2)41F021 motor-operated valves. The HV-1(2)41F020 valve is normally open and will not need to be operated. The HV-1(2)41F021 valve is normally closed and will need to be opened by an operator by means of a hand switch in the control room. There are three normally open motor-operated valves that will need to be closed by an operator to prevent leakage to other areas of the TB. These boundary valves are HV-1(2)0107 to steam jet air ejector, HV-1(2)0109 to steam seal evaporator, and HV-1(2)0111, to reactor feed pump turbines. The hand switches for these valves are in the control room.

Per FSAR Section 6.7.2.1.2, alternate orificed pathways (which do not require the opening of any valves) exist as a backup to direct MSIV leakage to the condenser should the HV-1(2)41F021 valve not open as expected. These pathways include: the orificed bypass line around the HV-1(2)041F021 valve; the four orificed drain lines from the main steam line eight inch drip legs; and the one orificed drain line from the main steam line twelve inch drip leg.

The Electro-Hydraulic Control and Logic System and the Electro-Hydraulic Control Hydraulic Power System do not perform any safety-related functions and therefore do not meet the criteria of 10 CFR 54.4(a)(1).

The Electro-Hydraulic Control and Logic System and the Electro-Hydraulic Control Hydraulic Power System do not have the potential to adversely affect safety-related systems or components through spatial interaction and therefore do not meet the criteria of 10 CFR 54.4(a)(2). As stated in LRA Section 2.1.1.2.2, there are no components located in the TB that either perform or would prevent a safety-related function from occurring.

The Electro-Hydraulic Control and Logic System and the Electro-Hydraulic Control Hydraulic Power System are not relied upon to demonstrate compliance with, nor satisfy the 10 CFR 54.4(a)(3) scoping criteria for, any regulated event.

Based on its review, the staff finds the applicant’s response to RAI 2.2-1 acceptable because the applicant clarified why the electro-hydraulic control and logic system and the electro-hydraulic control hydraulic power system are not within the scope of license renewal. Therefore, the staff’s concern described in RAI 2.2-1 is resolved.

In RAI 2.2-2, dated August 27, 2007, the staff noted that LRA Table 2.2-1 defines the circulating water system (CWS) as not within the scope of license renewal. Applicants with similar plant designs have included the CWS within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff requested that the applicant provide additional information to justify exclusion of the CWS from scope with respect to the applicable requirements pursuant to 10 CFR 54.4(a).

In its response to RAI 2.2-2, dated October 18, 2007, the applicant stated:

> As described in Section 10.4.5 of the FSAR, the Circulating Water System for SSES has no safety-related functions and is designed to remove the latent heat from the main condenser and sensible heat from the Service Water System and dissipate both in a hyperbolic natural draft cooling tower. Failure of the Circulating Water System will not prevent the satisfactory accomplishment of any safety-related functions and therefore, does not meet the criteria of 10 CFR 54.4(a)(1).
>
> In addition, failure of the Circulating Water System will not adversely affect any safety-related systems or components through spatial interaction and system piping is not connected to any safety-related piping. There is no potential for spatial interaction of the Circulating Water System with safety-related components, because circulating water piping is not routed in structures or outdoor areas that contain safety-related components. Portions of the Circulating Water System are routed in the Turbine Building. However, as described in Section 2.1.1.2.2 of the LRA (pg. 2.1-6) there are no components located in the Turbine Building that either perform or would prevent a safety-related function from occurring. Therefore, the Circulating Water System does not meet the criteria of 10 CFR 54.4(a)(2).
>
> As evaluated in FSAR Section 10.4.1.3.3, flooding due to the rupture of a circulating water expansion joint in the Turbine Building will not affect any safety-related equipment. The Circulating Water System is not relied upon to demonstrate compliance with any regulated event and, therefore, does not meet the criteria of 10 CFR 54.4(a)(3).

In a telephone conference call, “Summary of Telephone Conference Call Held December 28, 2007, between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC, Concerning Requests for Additional Information Pertaining to the Susquehanna Steam Electric Station, Unit 1 and 2, License Renewal Application,” (see Appendix B) the staff noted that UFSAR Section 10.4.5 identifies the cooling towers and its piping as part of the CWS. The UFSAR identifies the cooling towers and the piping from the cooling towers as a secondary source of fire protection water, making this portion of the CWS within the scope of license renewal, based on criterion pursuant to 10 CFR 54.4(a)(3). Furthermore, boundary drawings LR-M-115, “Unit 1 License Renewal Boundary Drawings Circulating Water,” and LR-M-2115, “Unit 2 License Renewal Boundary Drawing Circulating Water,” identify the cooling tower basins and a portion of the pipes from the cooling tower basins as within the scope of license renewal, based on criterion in accordance with 10 CFR 54.4(a)(3).

The applicant replied as follows:

> The 108-inch piping exiting the Unit 1 cooling tower basin and the 78-inch line exiting the Unit 2 cooling tower basin provide water to both the circulating water system and the service water system. Therefore, this piping is functionally part of two systems. Within the SSES maintenance program this piping is considered part of the cooling tower system. The LRA system designation is based on the “functional” purpose of the cooling tower basins and piping rather than the FSAR description.

Based on its review, the staff finds the applicant’s response to RAI 2.2-2 acceptable because the applicant has clarified that the LRA system designation is based on the functional purpose of the cooling tower basins and piping rather than the UFSAR system designation and that within the SSES maintenance program, this piping is considered part of the cooling tower system, which is within the scope of license renewal. Therefore, the staff’s concern described in RAI 2.2-2 is resolved.

In RAI 2.2-1, dated July 25, 2007, the staff requested that the applicant provide justification for the exclusion of the miscellaneous HVAC systems (Chlorination Building HVAC, Circulating Water Pump Room HVAC, Intake Works HVAC, Service and Administration Building HVAC, Service Water Pump Room HVAC, Turbine Building HVAC, and Water Treatment Room HVAC) and their applicable components and passive functions from the scope of license renewal. If these systems and their applicable components are within the scope of license renewal, in accordance with 10 CFR 54.4(a), and subject to an AMR pursuant to 10 CFR 54.21(a)(1), update the LRA by providing the applicable information in the appropriate LRA sections, tables, and boundary drawings.

In its response to RAI 2.2-1, dated August 23, 2007, the applicant stated:

> Chlorination Building HVAC - The Chlorination Building is part of the structure that is identified in the LRA as the Chlorination and Acid Storage Building. As stated in LRA Table 2.2-3, the Chlorination and Acid Storage Building is not within the scope of license renewal. There are no safety-related components located in the building. Therefore, the HVAC components located in the building are not in-scope based upon the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2). In addition, no components located in the building support any regulated events for a

BWR. Therefore, the HVAC components are also not in-scope based on the criterion of 10 CFR 54.4(a)(3). The Chlorination Building HVAC System does not provide a supporting function applicable to equipment within the scope of license renewal, therefore it is not within the scope of license renewal.

Circulating Water Pump Room HVAC - The Circulating Water Pump Room is part of the structure identified in the LRA as the Circulating Water Pumphouse and Water Treatment Building. As stated in LRA Table 2.2-3, the Circulating Water Pumphouse and Water Treatment Building is within the scope of license renewal. LRA Section 2.4.4 states that the building is relied upon to demonstrate compliance with the regulation 10 CFR 50.48 for Fire Protection by providing physical support and protection to the fire water pumps. There are no safety-related components located in the Circulating Water Pumphouse and Water Treatment Building, which contains the Circulating Water Pump Room. Therefore, the HVAC components located in the Circulating Water Pump Room are not in-scope based upon the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2). While there is fire protection equipment located in Circulating Water Pumphouse and Water Treatment Building that is in-scope, based on criterion of 10 CFR 54.4(a)(3), this equipment does not require support from the Circulating Water Pump Room HVAC. Therefore, the HVAC components located in Circulating Water Pump Room are not in-scope based upon the criterion of 10 CFR 54.4(a)(3). The Circulating Water Pump Room HVAC System does not provide a supporting function for any equipment within the scope of license renewal, therefore, it is not within the scope of license renewal.

Intake Works HVAC - The Intake Works is part of the structure identified in the LRA as the River Intake Structure. As stated in LRA Table 2.2-3, the River Intake Structure is not within the scope of license renewal. There are no safety-related components located in the structure. Therefore, the HVAC components located in the structure are not in-scope based upon the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2). In addition, no components located in the structure support any regulated events for a BWR. Therefore, the HVAC components are also not in-scope based on the criterion of 10 CFR 54.4(a)(3). The Intake Works HVAC System does not provide a supporting function applicable to equipment within the scope of license renewal, therefore, it is not within the scope of license renewal.

Service and Administration Building HVAC - As stated in LRA Table 2.2-3, the Service and Administration Building is not within the scope of license renewal. There are no safety-related components located in the Service and Administration Building. Therefore, the HVAC components located in the Service and Administration Building are not in-scope based upon the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2). In addition, no components located in the Service and Administration Building support any regulated events for a BWR. Therefore, the HVAC components are also not in-scope based on the criterion of 10 CFR 54.4(a)(3). The Service and Administration Building HVAC System does not provide a supporting function applicable to equipment within the scope of license renewal, therefore it is not within the scope of license renewal.

Service Water Pump Room HVAC - The Service Water Pump Room is part of the structure identified in the LRA as the Circulating Water Pumphouse and Water Treatment Building. As stated in LRA Table 2.2-3, the Circulating Water Pumphouse and Water Treatment Building is within the scope of license renewal. LRA Section 2.4.4 states that the building is relied upon to demonstrate compliance with the regulation 10 CFR 50.48 for Fire Protection by providing physical support and protection to the fire water pumps. There are no safety-related components located in the Circulating Water Pumphouse and Water Treatment Building, which contains the Service Water Pump Room. Therefore, the HVAC components located in the Service Water Pump Room are not in-scope based upon the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2). While there is fire protection equipment located in Circulating Water Pumphouse and Water Treatment Building that is in-scope based on criterion of 10 CFR 54.4(a)(3), this equipment does not require support from the Service Water Pump Room HVAC. Therefore, the HVAC components located in the Service Water Pump Room are not in-scope based upon the criterion of 10 CFR 54.4(a)(3). The Service Water Pump Room HVAC System does not provide a supporting function applicable to equipment within the scope of license renewal, therefore it is not within the scope of license renewal.

Turbine Building HVAC - As stated in LRA Table 2.2-3, the Turbine Building is within the scope of license renewal. LRA Section 2.4.8 provides the reasons for the building being in-scope. There are no safety-related components located in the Turbine Building. Therefore, the HVAC components located in the Turbine Building are not in-scope based upon the criterion of 10 CFR 54.4(a)(1). While there is equipment in the Turbine Building that is in-scope based on the criteria of 10 CFR 54.4(a)(2) and 10 CFR 54.4(a)(3), this equipment does not require support from the Turbine Building HVAC. Therefore, the HVAC components located in the Turbine Building are not in-scope based upon the criteria of 10 CFR 54.4(a)(2) and 10 CFR 54.4(a)(3). The Turbine Building HVAC System does not provide a supporting function for the equipment within the scope of license renewal, therefore it is not within the scope of license renewal.

Water Treatment Room HVAC - The Water Treatment Room is part of the structure identified in the LRA as the Circulating Water Pumphouse and Water Treatment Building. As stated in LRA Table 2.2-3, the Circulating Water Pumphouse and Water Treatment Building is within the scope of license renewal. LRA Section 2.4.4 states that the building is relied upon to demonstrate compliance with the regulation 10 CFR 50.48 for Fire Protection by providing physical support and protection to the fire water pumps. There are no safety-related components located in the Circulating Water Pumphouse and Water Treatment Building, which contains the Water Treatment Room. Therefore, the HVAC components located in the Water Treatment Room are not in-scope based upon the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2). While there is fire protection equipment located in the Circulating Water Pumphouse and Water Treatment Building that is in-scope based on criterion of 10 CFR 54.4(a)(3), this equipment does not require support from the Water Treatment Room HVAC. Therefore, the HVAC components are also not in-scope based on the criterion of 10 CFR 54.4(a)(3). The Water Treatment Room HVAC System does not provide a supporting function applicable to equipment within the scope of license renewal, therefore it is not within the scope of license renewal.

Based on its review, the staff finds the applicant's response to staff's RAI 2.2-1 acceptable because the applicant clarified why the miscellaneous HVAC systems (Chlorination Building HVAC, Circulating Water Pump Room HVAC, Intake Works HVAC, Service and Administration Building HVAC, Service Water Pump Room HVAC, Turbine Building HVAC, and Water Treatment Room HVAC systems) are not within the scope of license renewal. Therefore, the staff's concern described in RAI 2.2-1 is resolved.

2.2.2 Conclusion

The staff reviewed LRA Section 2.2, the RAI responses, and the UFSAR supporting information to determine whether the applicant failed to identify any systems and structures within the scope of license renewal. On the basis of its review, the staff concludes that the applicant has appropriately identified the systems and structures within the scope of license renewal in accordance with 10 CFR 54.4 and; therefore, is acceptable.

2.3 Scoping and Screening Results: Mechanical Systems

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

- Reactor vessel (RV), RV internals, and reactor coolant system (RCS)
- Engineered safety features (ESF)
- Auxiliary systems
- Steam and power conversion systems

Staff Evaluation of Mechanical System Scoping and Screening Results

This staff evaluation of the mechanical system scoping and screening results applies to all mechanical systems reviewed. Those systems that required requests for additional information

(RAIs) to be generated (if any) include an additional staff evaluation which specifically addresses the applicant's response to the RAI(s).

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 the applicant has identified the mechanical system 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 mechanical systems with the exception of those few selected systems described Sections 2.3.3 and 2.3.4 as receiving an alternate review. The staff used was performed using the evaluation methodology described here, in SER Section 2.3 and the guidance in SRP-LR Section 2.3, and took into account (where applicable) the system function(s) described in the UFSAR. The objective was to determine whether the applicant identified, in accordance with 10 CFR 54.4, components and supporting structures for mechanical systems that 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 the scoping evaluation, the staff reviewed the LRA, UFSAR, license renewal boundary drawings, and other licensing basis documents, as appropriate, for each mechanical system within the scope of license renewal. The staff reviewed the licensing basis documents to confirm that the LRA specified all intended functions pursuant to 10 CFR 54.4(a). The review then focused on identifying components with intended functions in accordance with 10 CFR 54.4(a) that had not been identified as within the scope of license renewal.

The staff then evaluated the applicant's screening results. For the SCs with intended functions in compliance with 10 CFR 54.4(a), the staff determined whether the functions are performed with moving parts or a change in configuration or properties or the SCs are subject to replacement after a qualified life or specified time period, pursuant to 10 CFR 54.21(a)(1). For SCs not meeting either of these criteria, the staff confirmed that the SCs are subject to an AMR, as required by 10 CFR 54.21(a)(1).

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

In LRA Section 2.3.1, the applicant identified the RV, RV internals, and RCS SCs subject to an AMR for license renewal. The applicant described the supporting SCs of the RV, RV internals, and RCS in the following LRA sections:

- 2.3.1.1 Reactor pressure vessel
- 2.3.1.2 Reactor vessel internals
- 2.3.1.3 Reactor coolant system pressure boundary

2.3.1.1 Reactor Pressure Vessel

2.3.1.1.1 Summary of Technical Information in the Application

LRA Section 2.3.1.1 describes the reactor pressure vessel (RPV), which provides a high integrity barrier against the leakage of radioactive materials, contains and supports the reactor core, RV internals, and coolant moderator, and provides a floodable volume in which the core can be adequately cooled in the event of a break in a line external to the vessel. The RPV contains safety-related components relied upon to remain functional during and following DBEs. LRA Table 2.3.1-1 identifies RPV component types within the scope of license renewal and subject to an AMR.

2.3.1.1.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the RPV system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 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 RV internals, which provide a high integrity barrier against the leakage of radioactive materials, support the reactor core and RV internals, provide a floodable volume in which the core can be adequately cooled in the event of a break in a line external to the vessel, and distribute flow as designed to promote mixing. The RV internals contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RV internals potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RV internals performs functions that support ATWS. LRA Table 2.3.1-2 identifies RV internals component types within the scope of license renewal and subject to an AMR.

2.3.1.2.2 Staff Evaluation:

The staff reviewed LRA Section 2.3.1.2 and UFSAR Section 3.9.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas requiring additional information to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.1-1, dated October 24, 2007, the staff noted in LRA Table 2.3.1-1, the nozzle N9 and cap for N9 were listed as in-scope as a pressure boundary. The staff identified boundary drawing LR-M-141-2 as showing nozzle N9 as out of scope. The staff requested that the applicant confirm that N9 nozzle and cap were in-scope.

In its response to RAI 2.3.1-1, dated November 14, 2007, the applicant stated:

> The highlighting of nozzle N9 and the cap for N9 on boundary drawing LR-M-141-2 was inadvertently omitted. As listed in LRA Table 2.3.1-1, nozzle N9 and the associated cap are within the scope of license renewal and subject to an AMR. The highlighting on LR-M-141-2 has been corrected to highlight nozzle N9 from the vessel wall to and including the associated cap. The highlighting of the Unit 2 N9 nozzle on LR-M-2141-2 has also been clarified to clearly show highlighting from the vessel wall to

> and including the cap. These were highlighting omissions on the boundary drawings and no changes to the LRA are required.

The staff confirms that the applicant has submitted revised boundary drawings LR-M-141-2 and LR-M-2141-2. Based on its review, the staff finds the applicant's response to RAI 2.3.1-1 acceptable because the applicant has clarified that the highlighting for nozzle N9 and the cap for N9 were inadvertently omitted and appropriate revisions were made to boundary drawings LR-M-141-2 and LR-M-2141-2. Therefore, the staff's concern described in RAI 2.3.1-1 is resolved.

In RAI 2.3.1-2, dated October 24, 2007, the staff noted boundary drawing LR-M-146 depicted valve 146-F004, and associate piping for a drive water pressure control station as out of scope. However, isolation valves between the out of scope and in-scope piping were not shown. The staff believes that this bypass line and valve should be within the scope of license renewal as a pressure boundary. The staff requested the applicant clarify whether the subject components were in-scope, thus, requiring an AMR and; if excluded, provide a justification.

In its response to RAI 2.3.1-2, dated November 14, 2007, the applicant stated:

> The highlighting of valve 146-F004 and the associated piping on boundary drawing LR-M-146-1 was inadvertently omitted. Valve 146-F004 and the associated piping are within the scope of license renewal and subject to aging management review. These components meet the scoping criteria for 10 CFR 54.4(a)(2) and are included in LRA Section 2.3.3.3, Table 2.3.3-3 and Table 3.3.2-3. The Unit 2 boundary drawing, LR-M-2146-1 shows the correct highlighting. This was a highlighting error and no changes to the LRA are required.

The staff confirmed that the applicant has submitted revised boundary drawing LR-M-146-1. Based on its review, the staff finds the applicant's response to RAI 2.3.1-2 acceptable because the applicant clarified that valve 146-F004 and associated piping are within the scope of license renewal and the highlighting was inadvertently omitted. The staff confirms that the applicant has made appropriate revisions to boundary drawings LR-M-141-2 and LR-M-2141-2. Therefore, the staff's concern described in RAI 2.3.1-1 is resolved.

2.3.1.2.3 Conclusion

The staff reviewed the LRA, UFSAR, boundary drawings (original and revised), and RAI responses to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes that the applicant has appropriately identified the RPV mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the RPV components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.1.3 Reactor Coolant System Pressure Boundary

2.3.1.3.1 Summary of Technical Information in the Application

LRA Section 2.3.1.3 describes the RCS pressure boundary, which includes the ASME Code Class 1 portions of these systems:

- Control Rod Drive Hydraulic System (Class 1 portions only)
- Core Spray System (Class 1 portions only)
- Feedwater System (Class 1 portions only)
- High-Pressure Coolant Injection System (Class 1 portions only)
- Main Steam System (Class 1 portions only)
- Reactor Core Isolation Cooling System (Class 1 portions only)
- Reactor Nonnuclear Instrumentation System (Class 1 portions only)
- Reactor Recirculation System
- Reactor Vessel and Auxiliaries (vent line and flange leak detection line only)
- Residual Heat Removal System (Class 1 portions only)
- Reactor Water Cleanup System (Class 1 portions only)
- Standby Liquid Control System (Class 1 portions only)
- In-scope portions of the reactor recirculation system are included for purposes of license renewal evaluation.

The RCS pressure boundary contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RCS pressure boundary potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RCS pressure boundary performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.1-3 identifies RCS pressure boundary component types within the scope of license renewal and subject to an AMR.

2.3.1.3.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the RCS system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2 *Engineered Safety Features*

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

- 2.3.2.1 Residual heat removal (RHR) system
- 2.3.2.2 Reactor core isolation cooling (RCIC) system
- 2.3.2.3 Core spray system (CSS)
- 2.3.2.4 High-pressure coolant injection (HPCI) system
- 2.3.2.5 Containment and suppression system

- 2.3.2.6 Containment atmosphere control system
- 2.3.2.7 Standby gas treatment system (SGTS)

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 is comprised of two independent loops, each with two motor-driven pumps, a heat exchanger, piping, valves, instrumentation, and controls. The RHR system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RHR system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RHR system performs functions that support fire protection, ATWS, and EQ. LRA Table 2.3.2-1 identifies RHR system component types within the scope of license renewal and subject to an AMR.

2.3.2.1.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the RHR system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.2 Reactor Core Isolation Cooling System

2.3.2.2.1 Summary of Technical Information in the Application

LRA Section 2.3.2.2 describes the RCIC system, which consists of a steam-driven turbine-pump unit, valves, and piping capable of delivering water from either the CST or the suppression pool to the RV via one of the feedwater lines. The RCIC system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RCIC system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RCIC system performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.2-2 identifies RCIC system component types within the scope of license renewal and subject to an AMR.

2.3.2.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.2 and UFSAR Section 5.4.6 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas where additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.2.2-1, dated October 24, 2007, the staff noted boundary drawings LR-M-150 and -2150 of the LRA depicted piping between the RCIC vacuum tank and the barometric condenser vacuum pump as not in-scope. The staff identified that Table 2.3.2-2 listed the piping and piping components function (under the vacuum tank) as structural integrity. Additionally, Tanks 1/2 T219 were depicted as in-scope in boundary drawing LR-M-150-1; but they were not listed in Table 2.3.2-2. The staff requested the applicant to confirm the connecting piping was included within the scope of license renewal and subjected to AMR as structural boundary or to justify its exclusion. In addition, the staff requested the applicant to modify Table 2.3.2-2 to reflect the response.

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

> The piping between the RCIC Barometric Condenser Vacuum Tank air space and the suction of the RCIC Barometric Condenser Vacuum Pump is not in-scope because these lines are not fluid filled. The RCIC Barometric Condenser Vacuum Pump is primarily removing air and non-condensables from the steam that is condensed in the RCIC Barometric Condenser. Therefore, this segment of piping does not contain sufficient liquid that would leak or spray on adjacent equipment.
>
> The RCIC Barometric Condenser Vacuum Pump and associated discharge piping is highlighted in magenta because it provides a structural integrity function for safety-related connected piping as indicated in license renewal note C on the subject drawings. The piping between the RCIC Barometric Condenser Vacuum Tank air space and the suction of the RCIC Barometric Condenser Vacuum Pump does not provide structural integrity for either the RCIC Barometric Condenser or Barometric Condenser Vacuum Pump, which also supports the piping not included in-scope for license renewal. Based on the above, LRA drawings LR-M-150 and LR-M-2150, Sheet 1, H7 are correct and no change is required.
>
> Review of LRA Table 2.3.2-2 and Table 3.2.2-2 identified that the RCIC Barometric Condenser Vacuum Pump (1/2P219) was inadvertently omitted from these tables. In addition, it was identified that the piping between the RCIC Barometric Condenser Vacuum Pump discharge and the suppression pool was inadvertently omitted from Table 3.2.2-2. The license renewal application was amended to include the RCIC Barometric Condenser Vacuum Pump and associated discharge piping as subject to aging management review.

The applicant submitted revised LRA Tables 2.3.2-2 and 3.2.2-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.2-1 acceptable because the applicant explained that the piping in question is not fluid filled and the RCIC Barometric Condenser Vacuum Pump removes air and non-condensables from steam. The applicant also explained that the piping in question does not provide structural integrity for any required components. The applicant identified several items that were inadvertently omitted from LRA Tables 2.3.2-2, "Reactor Core Isolation Cooling System Components Subject to Aging Management Review," and Table 3.2.2-2, "Aging management review Results – Reactor Core Isolation Cooling System." The applicant amended the LRA to include these revised tables. Therefore, the staff's concern described in RAI 2.3.2.2-1 is resolved.

2.3.2.2.3 Conclusion

The staff reviewed the LRA, UFSAR, boundary drawings, RAI responses, and revised LRA tables to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes that the applicant has appropriately identified reactor core isolation cooling system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the reactor core isolation cooling system components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.3 Core Spray System

2.3.2.3.1 Summary of Technical Information in the Application

LRA Section 2.3.2.3 describes the CSS, which, as part of the overall emergency core cooling system, is designed to provide cooling to the reactor core only when the RV pressure is low, as for a large-break loss-of-coolant accident (LOCA). However, when operating with the automatic depressurization system, the effective CSS core cooling capability extends to all break sizes as the automatic depressurization system rapidly reduces the RV pressure to the CSS operating range. The CSS contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the CSS potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the CSS performs functions that support fire protection and EQ. LRA Table 2.3.2-3 identifies CSS component types within the scope of license renewal and subject to an AMR.

2.3.2.3.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the CSS system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.4 High Pressure Coolant Injection System

2.3.2.4.1 Summary of Technical Information in the Application

LRA Section 2.3.2.4 describes the HPCI system, which consists of a steam-driven turbine-pump unit, valves, and piping that can deliver water from the condensate storage tank (CST) or from the suppression pool to the RV via one of the feedwater lines. The HPCI system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the HPCI system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the HPCI system performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.2-4 identifies HPCI system component types within the scope of license renewal and subject to an AMR.

2.3.2.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.4 and UFSAR Section 6.3.2.2.1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas where additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.2.4-1, dated October 24, 2007, the staff noted that in boundary drawing LR-M-156-1, the drive shaft from the HPCI turbine to the HPCI pump was shown in-scope, however, the drive shaft between the HPCI pump and booster pump was not. The staff requested that the applicant clarify whether the drive shafts were in-scope, thus, requiring an AMR and; if excluded, provide justification.

In its response to RAI 2.3.2.4-1, dated November 14, 2007, the applicant stated:

> The highlighting of the drive shaft between the HPCI pump and booster pump on boundary drawing LR-M-156-1 was inadvertently omitted. The entire drive shaft is within the scope of license renewal. The highlighting has been corrected to show this drive shaft highlighted in green. The unit 2 boundary drawing, LR-M-2156-1 shows the correct highlighting.
>
> The drive shafts and gearbox between the HPCI booster pump and the HPCI pump and the drive shafts between the HPCI pump and the HPCI turbine are within the scope of license renewal. The drive shafts and gear box are considered to be active components and therefore are not subject to aging management review.
>
> This was a highlighting omission on a boundary drawing and no changes to the LRA are required.

The staff confirmed that the applicant has submitted revised boundary drawing LR-M-156-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.4-1 acceptable because the applicant clarified that the highlighting of the drive shaft between the HPCI pump and booster pump was in error and the drive shaft is in-scope. The staff confirms that the applicant has submitted a corrected boundary drawing LR-M-156-1. Therefore, the staff's concern described in RAI 2.3.2.4-1 is resolved.

2.3.2.4.3 Conclusion

The staff reviewed the LRA, UFSAR, boundary drawings (original and revised), and RAI responses to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes that the applicant has appropriately identified the HPCI system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the HPCI system components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

***2.3.2.5 Containment and Suppression** System*

2.3.2.5.1 Summary of Technical Information in the Application

LRA Section 2.3.2.5 describes the containment and suppression system, which maintains the structural and functional integrity of the primary containment during and following a design-basis LOCA. The system also monitors suppression pool level, pressure, and temperature and provides for suppression pool cleanup. The containment and suppression system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the containment and suppression system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the containment and suppression system performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.2-5 identifies containment and suppression system component types within the scope of license renewal and subject to an AMR.

2.3.2.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.5 and UFSAR Section 6.2.1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas where additional information was required to complete the scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.2.5-1 dated July 25, 2007, the staff noted that on boundary drawing LR-M-157, Sheet 4, one-inch valve 157011 at penetration X-234A and one-inch valve 157023 at penetration X-232A, which belong to suppression pool level monitoring system, are shown as not within the scope of license renewal. The staff requested that the applicant provide justification for the exclusion of these valves from the scope of license renewal. If these valves 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), the staff requested that the applicant update the LRA by providing the applicable information in the appropriate LRA sections, tables, and boundary drawings.

In its response to RAI 2.3.2.5-1, dated August 23, 2007, the applicant stated:

> Boundary drawing LR-M-157 Sheet 4 contained an error related to highlighting. Valve 157011 at penetration X-234A and valve 157023 at penetration X-232A are both in-scope and subject to aging management review, but they were inadvertently not highlighted. Both valves have been highlighted in green on the revised boundary drawing LR-M-157 Sheet 4, included as Attachment 1.
>
> In the course of addressing this RAI, it was also noticed that the highlighting at penetration X-90D for one-inch line HCB-112 was slightly different from the highlighting for the other pipelines at penetrations X-90A and X-90D. The short length of piping between valve 157077 and the penetration should have been highlighted. This piping is in-scope and subject to aging management review, but was inadvertently not highlighted. This piping has been highlighted in green on the revised boundary drawing LR-M-157 Sheet 4, included as Attachment 1.

> No changes to the LRA are required as valves 157011 and 157023 are addressed in Table 2.3.2-5, and the material/environment combinations for the valve bodies are addressed in Table 3.2.2-5. The additional piping component associated with one-inch line HCB-112 belongs to the Containment Atmosphere Control System. No changes to the LRA are required as the piping is included in Table 2.3.2-6 and the material/environment combinations for the piping are addressed in Table 3.2.2-6.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.5-1 acceptable because the applicant clarified that the that one-inch valve 157011 at penetration X-234A and one-inch valve 157023 at penetration X-232A are within the scope of license renewal and were inadvertently not highlighted. The staff confirms that the applicant has provided revised boundary drawing LR-M-157, Sheet 4, with correct highlighting. Therefore, the staff's concern described in RAI 2.3.2.5-1 is resolved.

In RAI 2.3.2.5-2, dated July 25, 2007, the staff noted that LRA Section 2.3.2.5, "Containment and Suppression System" under "License Renewal Drawings" lists boundary drawings LR-M-151 Sheet 1, and LR-M-155 Sheet 1 for Unit 1, and LR-M-2151 Sheet 1, and LR-M-2155, Sheet 1 for Unit 2. The staff requested that the applicant clarify which functions or items shown in these boundary drawing belong to the containment and suppression system.

In its response to RAI 2.3.2.5-2, dated August 23, 2007, the applicant stated:

> The evaluation boundaries of the Containment and Suppression System that are shown on drawing LR-M-151 Sheet 1 for Unit 1 (LR-M-2151 Sheet 1 for Unit 2) are within the Non Safety Affecting Safety (NSAS) boundaries highlighted in magenta and extend from valve 151089 in zone B-1 for Unit 1 (valve 251088 in zone B-1 for Unit 2) through four-inch pipeline HBD-173 (4-inch HBD-273 for Unit 2) and continuing on drawing LR-M-157 Sheet 1 for Unit 1 (LR-M2157 Sheet 1 for Unit 2). Components within these boundaries, subject to aging management review, are included as piping and piping components with a structural integrity function, as listed in Table 2.3.2-5 in LRA Section 2.3.2.5.
>
> The evaluation boundaries of the Containment and Suppression System that are shown on drawing LR-M-155 Sheet 1 for Unit 1 (LR-M-2155 Sheet 1 for Unit 2) extend from penetrations X-219A and X-219B in zone G-3/H-3 to and including level switches LSH-E41-1N015A & B for Unit 1 (E41-2N015A & B for Unit 2) and continuing to drawing LR-M-157 Sheet 8 for Unit 1 (LR-M-2157 Sheet 8 for Unit 2). Components within these boundaries, subject to aging management review, include condensing pots, piping, tubing, and valve bodies, all of which are listed in Table 2.3.2-5 in LRA Section 2.3.2.5 with a pressure boundary function.
>
> Based on the discussion above, no changes to the LRA are required.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.5-2 acceptable because the applicant clarified which components are parts of the containment and suppression system. Therefore, the staff's concern described in RAI 2.3.2.5-2 is resolved.

2.3.2.5.3 Conclusion

The staff reviewed the LRA, UFSAR, boundary drawings (original and revised), and RAI responses to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes that the applicant has appropriately identified the containment and suppression system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the containment and suppression system components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.2.6 Containment Atmosphere Control System

2.3.2.6.1 Summary of Technical Information in the Application

LRA Section 2.3.2.6 describes the containment atmosphere control (CAC) system, which is designed to control the concentration of hydrogen within the primary containment following a LOCA. The CAC system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the CAC system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the CAC system performs functions that support fire protection, SBO, and EQ. LRA Table 2.3.2-6 identifies CAC system component types within the scope of license renewal and subject to an AMR.

2.3.2.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.6 and UFSAR Section 6.2.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas where additional information was required to complete the scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.2.6-1, dated July 25, 2007, the staff noted that LRA Section 2.3.2.6 identifies the Combustible Gas Control System described in UFSAR Section 6.2.5 as Containment Atmosphere Control System for license renewal. The description and functions of Containment Atmospheric Control System as described in LRA Section 2.3.2.6 is not consistent with the description given in UFSAR Section 6.2.5 for Units 1 and 2. According to UFSAR Section 6.2.5.2, the combustible gas control depends on the following functions and subsystems:

(a) Hydrogen mixing
(b) Hydrogen and oxygen monitoring system
(c) Hydrogen recombiner system
(d) Containment hydrogen purge system
(e) Containment nitrogen inerting system

The LRA Section 2.3.2.6 does not mention the Containment Nitrogen Inerting System which maintains the primary containment inerted with nitrogen during power operation, with oxygen concentration not to exceed 4% by volume. The staff requested the applicant either add the description of Containment Nitrogen Inerting System in LRA Section 2.3.2.6 or add another section to the LRA describing this system and its license renewal function.

In its response to RAI 2.3.2.6-1, dated August 23, 2007, the applicant stated:

> While FSAR Section 6.2.5 identifies containment nitrogen inerting as a function of the combustible gas control system, identified as Containment Atmosphere Control in the LRA, nitrogen inerting is not an engineered safety feature (ESF) function.
>
> The Nitrogen and Hydrogen System is described in LRA Section 2.3.3.16. As stated in Section 2.3.3.16, a nonsafety-related portion of this system is identified as in-scope based on the scoping criteria of 10 CFR 54.4(a)(2). This is illustrated on license renewal drawings LR-M-157 Sheet 1 for Unit 1 and LR-M-2157 Sheet 1 for Unit 2 at zone C-8 by the piping and components shown in magenta.
>
> The piping and components related to the function of containment nitrogen inerting and makeup that are highlighted in green on LR-M-157 Sheet 1 and LR-M-2157 Sheet 1 have a safety-related function to provide primary containment isolation and maintain containment integrity. These components are addressed in LRA Section 2.3.2.6 as in-scope based on the scoping criteria of 10 CFR 54.4(a)(1) because they support either the functional or structural integrity of the primary containment. Both LRA Sections 2.3.3.16 and 2.3.2.6 reference drawings LR-M-157 Sheet 1 and LR-M-2157 Sheet 1 which depict the in-scope portions of the Nitrogen and Hydrogen System and the Containment Atmosphere Control System.
>
> Based on a teleconference between PPL and the NRC Staff on July 10, 2007, revisions discussed for LRA Sections 2.3.2.5 and 2.3.2.6 are provided in Attachments 2 and 3. The revisions to both attachments consist of added text which is shown in *bold italics.*

Based on its review, the staff finds the applicant's response to RAI 2.3.2.6-1 acceptable because the applicant clarified what is included in the containment and suppression system. The staff confirms that the applicant has provided revised LRA Sections 2.3.2.5 and 2.3.2.6. Therefore, the staff's concern described in RAI 2.3.2.6-1 is resolved.

In RAI 2.3.2.6-2, dated July 25, 2007, the staff noted that UFSAR Table 6.2-12, "Containment Penetration Data," shows the 24-inch butterfly valve HV15722 as a containment isolation safety-related valve located at drywell penetration X-25. This valve located in zone C-5 of boundary drawing LR-M-157 Sheet No. 1 is shown as not within the scope of license renewal. The staff requested that applicant provide justification for the exclusion of this valve from the scope of license renewal. If this valve is within the scope of license renewal, in accordance with 10 CFR 54.4(a), and subject to an AMR in accordance with 10 CFR 54.21(a)(1), the staff requested that the applicant update the LRA by providing the applicable information in the appropriate LRA sections, tables, and boundary drawings.

In its response, dated August 23, 2007, the applicant stated:

> Boundary drawing LR-M-157 Sheet 1 contained an error related to highlighting. Valve 157022 and the short length of piping between the valve and penetration X-25 are in-scope and subject to aging management review, but they were inadvertently not highlighted. The valve and the piping have been highlighted in green on the revised boundary drawing LR-M-157 Sheet 1, included as Attachment 4
>
> No changes to the LRA are required as the valve and piping are included Table 2.3.2-6 and the material/environment combinations for the valve and piping are addressed in Table 3.2.2-6.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.6-2 acceptable because the applicant clarified that valve 157022 and the short length of piping between the valve and penetration X-25 are in-scope and subject to an AMR. The staff confirms that the applicant has provided a revised boundary drawing LR-M-157, Sheet 1. Therefore, the staff's concern described in RAI 2.3.2.6-2 is resolved.

In RAI 2.3.2.6-3, dated July 25, 2007, the staff noted that LRA Section 2.3.2.6, "Containment Atmosphere Control System", under the heading "License Renewal Drawings", lists LR-M-157, Sheets 6 and 7 for Unit 1, and LR-M-2157, Sheets 6 and 7 for Unit 2. These boundary drawings provide containment radiation monitoring details that appear to not have any item described in LRA Section 2.3.2.6. The staff requested that the applicant provide justification for listing these boundary drawings in LRA Section 2.3.2.6. If any of the system components in these boundary drawings belong to the LRA Section 2.3.2.6, the staff requested that the applicant provide a list of these components and revise LRA Table 2.3.2-6, as required. (Note that suppression pool level and temperature functions are covered in the containment and suppression system in LRA Section 2.3.2.5, which lists these boundary drawings under "License Renewal Drawings" and the containment radiation monitoring system is covered in LRA Section 2.3.3.18, which lists these under the heading "License Renewal Drawing").

In its response to RAI 2.3.2.6-3, dated August 23, 2007, the applicant stated:

> The Containment Radiation Monitoring (CRM) Panels (1C291A/B for Unit 1 and 2C291A/B for Unit 2) and all components within them (shown on drawings LR-M-157 Sheets 6 and 7 for Unit 1 and LR-M-2157 Sheets 6 and 7 for Unit 2) are within the evaluation boundaries of the Process and Area Radiation Monitoring System. In accordance with the guidance provided in NEI 95-10 Appendix B, radiation monitors are considered to be active components and, therefore, not subject to aging management review. This conclusion is presented, along with a description of the Process and Area Radiation Monitoring System and reference to the above mentioned drawings, in LRA Section 2.3.3.18.
>
> Drawings LR-M-157 Sheets 6 and 7 for Unit 1 (LR-M-2157 Sheets 6 and 7 for Unit 2) are also included in LRA Section 2.3.2.6 because components that are within the evaluation boundaries of the Containment Atmosphere Control (CAC) System are depicted. The CAC System evaluation boundaries extend from penetrations X-5 and X-91A for Unit 1

> (X-5 and X-31B for Unit 2) to the pipe-to-tubing interface at CRM Panels 1C291A/B for Unit 1 (2C291A/B for Unit 2), and include the piping and valve bodies. The piping and valve bodies are evaluated in LRA Section 2.3.2.6, and the tubing is evaluated with the Process and Area Radiation Monitoring System in LRA Section 2.3.3.18.
>
> Based on the discussion above, no changes to the LRA are required.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.6-3 acceptable because the applicant clarified that LR-M-157 Sheets 6 and 7 contain components that are in the CAC system; thus, boundary drawing LR-M-157 Sheets 6 and 7 are listed in LRA Section 2.3.2.6. Therefore, the staff's concern described in RAI 2.3.2.6-3 is resolved.

In RAI 2.3.2.6-4, dated July 25, 2007, the staff noted that LRA Section 2.3.2.6, "Containment Atmosphere Control System", under the heading "License Renewal Drawings", lists LR-M-157 Sheet 8 for Unit 1, and LR-M-2157 Sheet 8 for Unit 2. These boundary drawings provide details of suppression pool level and pressure monitoring that appears to not have any items described in LRA Section 2.3.2.6. The staff requested that the applicant provide justification for listing the above boundary drawings in LRA Section 2.3.2.6. If any of the system components in these boundary drawings belong to the LRA Section 2.3.2.6, the staff requested that the applicant provide a list of these components and revise LRA Table 2.3.2-6, as required. (Note that suppression pool level and temperature functions are covered in the containment and suppression system in LRA Section 2.3.2.5, which lists these boundary drawings under the heading "License Renewal Drawings").

In its response to RAI 2.3.2.6-4, dated August 23, 2007, the applicant stated:

> All tubing and valve bodies associated with level transmitters LT-15775A and LT-25775A, as shown on drawings LR-M-157 Sheet 8 and LR-M-2157 Sheet 8, respectively, are within the evaluation boundaries of the Containment and Suppression System and are listed in Table 2.3.2-5 in LRA Section 2.3.2.5. All other components that are shown on drawings LR-M-157 Sheet 8 and LR-M-2157 Sheet 8 are within the evaluation boundaries of the Containment Atmosphere Control (CAC) System and are listed in Table 2.3.2-6 in LRA Section 2.3.2.6 (tubing and valve bodies).
>
> Based on the discussion above, no changes to the LRA are required.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.6-4 acceptable because the applicant provided a list of components in LR-M-157, Sheet 8 and LR-M-2157, Sheet 8 that are in the CAC system. Therefore, the staff's concern described in RAI 2.3.2.6-4 is resolved.

In RAI 2.3.2.6-5, dated July 25, 2007, the staff noted boundary drawing LR-M-157, Sheet 1, zone F-3, at primary containment penetration X-221A, shows the piping component at the upstream side of valve 157201 as not within the scope for license renewal. The staff requested that the applicant provide justification for the exclusion of this piping component from the scope of license renewal. If this component is within the scope of license renewal, in accordance with 10 CFR 54.4(a), and subject to an AMR, in accordance with

10 CFR 54.21(a)(1), the staff requested that the applicant update the LRA by providing the applicable information in the appropriate LRA sections, tables, and boundary drawings.

In its response to RAI 2.3.2.6-5, dated August 23, 2007, the applicant stated:

> Boundary drawing LR-M-157 Sheet 1 contained an error related to highlighting. Valve 157201 at penetration X-221A has a two-inch by one-inch reducer that is in-scope and subject to aging management review, but it was inadvertently not highlighted. The reducer has been highlighted in green on the revised boundary drawing LR-M-157 Sheet 1, included as Attachment 4.
>
> No changes to the LRA are required as the reducer is included in Table 2.3.2-6 and the material/environment combinations for the reducer are addressed in Table 3.2.2-6.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.6-5 acceptable because the applicant has clarified that boundary drawing LR-M-157, Sheet 1, contained a highlighting error regarding valve 157201 at penetration X-221A. The staff confirms that the applicant has submitted revised boundary drawing LR-M-157 Sheet 1. Therefore, the staff's concern described in RAI 2.3.2.6-5 is resolved.

2.3.2.6.3 Conclusion

The staff reviewed the LRA, UFSAR, boundary drawings (original and revised), and RAI responses to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes that the applicant has appropriately identified CAC system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the CAC system components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.2.7 Standby Gas Treatment System

2.3.2.7.1 Summary of Technical Information in the Application

LRA Section 2.3.2.7 describes the SBGT common to both units. The system is designed for two purposes: (1) to exhaust filtered air from the Reactor Building to maintain a negative pressure in the affected volumes following secondary containment isolation for a spent fuel handling accident or for a LOCA and (2) to filter the exhausted air to remove radioactive particulates and both radioactive and nonradioactive forms of iodine to limit offsite dose. The SGTS contains safety-related components relied upon to remain functional during and following DBEs. In addition, the SGTS performs functions that support EQ. LRA Table 2.3.2-7 identifies SGTS component types within the scope of license renewal and subject to an AMR.

2.3.2.7.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the SBGT system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

In LRA Section 2.3.3, the applicant identified 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 Building drains nonradioactive system
- 2.3.3.2 Containment instrument gas system
- 2.3.3.3 Control rod drive hydraulics system
- 2.3.3.4 Control structure chilled water system
- 2.3.3.5 Control structure HVAC systems
- 2.3.3.6 Cooling tower system
- 2.3.3.7 Diesel fuel oil system
- 2.3.3.8 Diesel generator buildings HVAC systems
- 2.3.3.9 Diesel generator system
- 2.3.3.10 Domestic water system
- 2.3.3.11 Emergency service water system
- 2.3.3.12 Engineered safeguards service water pumphouse HVAC system
- 2.3.3.13 Fire protection system
- 2.3.3.14 Fuel pool cooling and cleanup system and fuel pools and auxiliaries
- 2.3.3.15 Neutron monitoring system
- 2.3.3.16 Nitrogen and hydrogen system
- 2.3.3.17 Primary containment atmosphere circulation system
- 2.3.3.18 Process and area radiation monitoring system
- 2.3.3.19 Radwaste liquid system
- 2.3.3.20 Radwaste solids handling system
- 2.3.3.21 Raw water treatment system
- 2.3.3.22 Reactor building chilled water system
- 2.3.3.23 Reactor building closed cooling water system
- 2.3.3.24 Reactor building HVAC system
- 2.3.3.25 Reactor nonnuclear instrumentation system
- 2.3.3.26 Reactor water cleanup system
- 2.3.3.27 RHR service water system
- 2.3.3.28 Sampling system
- 2.3.3.29 Sanitary drainage system
- 2.3.3.30 Service air system
- 2.3.3.31 Service water system
- 2.3.3.32 Standby liquid control system
- 2.3.3.33 Turbine building closed cooling water system

Auxiliary Systems Generic Requests for Additional Information

As part of the staff's review, the following RAIs identified instances of boundary drawing errors where the continuation notation for piping from one boundary drawing to another boundary drawing could not be identified or was incorrect:

- RAI 2.3.3.14-1
- RAI 2.3.3.14-2
- RAI 2.3.3.14-11
- RAI 2.3.3.27-1
- RAI 2.3.3.27-2
- RAI 2.3.3.31-2

In its response, dated October 18, 2007, the applicant noted these were typographical errors and submitted revised the boundary drawings.

Based on its review, the staff finds the applicant's responses to these RAIs acceptable because the applicant revised the boundary drawings to correct the errors. Therefore, the staff's concerns described in the RAIs noted above are resolved.

2.3.3.1 Building Drains Nonradioactive System

2.3.3.1.1 Summary of Technical Information in the Application

LRA Section 2.3.3.1 describes the building drains nonradioactive system operating throughout the plant. The failure of nonsafety-related SSCs in the building drains nonradioactive system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-1 identifies building drains nonradioactive system component types within the scope of license renewal and subject to an AMR.

2.3.3.1.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the building drains nonradioactive system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.2 Containment Instrument Gas System

2.3.3.2.1 Summary of Technical Information in the Application

LRA Section 2.3.3.2 describes the containment instrument gas system, which provides filtered, dry, oil-free instrument gas to the pneumatic devices located inside the drywell and suppression chamber. The failure of nonsafety-related SSCs in the containment instrument gas system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the containment instrument gas system performs functions that support fire protection, SBO, and EQ. LRA Table 2.3.3-2 identifies containment instrument gas system component types within the scope of license renewal and subject to an AMR.

2.3.3.2.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the containment instrument gas system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.3 Control Rod Drive Hydraulics System

2.3.3.3.1 Summary of Technical Information in the Application

LRA Section 2.3.3.3 describes the control rod drive hydraulic system (CRDHS), which controls gross changes in core reactivity by incrementally positioning neutron-absorbing control rods within the reactor core in response to manual control signals initiated by the reactor manual control system. The CRDHS also must shut down the reactor quickly (scram) in response to manual or automatic signals in emergency situations by rapidly inserting withdrawn control rods into the core. The CRDHS contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the CRDHS potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the CRDHS performs functions that support fire protection, ATWS, and EQ. LRA Table 2.3.3-3 identifies CRDHS component types within the scope of license renewal and subject to an AMR.

2.3.3.3.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the CRDHS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.4 Control Structure Chilled Water System

2.3.3.4.1 Summary of Technical Information in the Application

LRA Section 2.3.3.4 describes the control structure chilled-water system, which supplies chilled water to the cooling coils in the control room floor cooling unit, computer room floor cooling unit, and control structure heating and ventilation unit. The control structure chilled-water system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the control structure chilled-water system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the control structure chilled-water system performs functions that support EQ. LRA Table 2.3.3-4 identifies control structure chilled-water system component types within the scope of license renewal and subject to an AMR.

2.3.3.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.4, UFSAR Section 9.2.12.1, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAIs 2.3.3.4-1, 2.3.3.4-2, and 2.3.3.4-3, dated August 27, 2007, the staff noted instances where boundary drawings identified portions of piping as within the scope of license renewal that are continued on other boundary drawings, where the piping is not shown to be within the scope of license renewal on the continuation boundary drawings. The staff requested that the applicant clarify why the continuations are not within the scope of license renewal.

In its response to RAIs 2.3.3.4-1, 2.3.3.4-2, and 2.3.3.4-3, dated October 18, 2007; the applicant stated that the subject piping was within the scope of license renewal. The applicant submitted revised boundary drawings to reflect the piping as being within the scope of licensing renewal.

Based on its review of the applicant's revised boundary drawings, the staff finds the applicant's response to RAIs 2.3.3.4-1, 2.3.3.4-2, and 2.3.3.4-3 acceptable because the applicant has clarified that the piping in question was within the scope of license renewal and has made the appropriate revisions to the subject boundary drawings. Therefore, the staff's concerns described in RAIs 2.3.3.4-1, 2.3.3.4-2, and 2.3.3.4-3 are resolved.

In RAI 2.3.3.4-4, dated August 27, 2007, the staff noted that the safety-related control structure H/V unit cooling coils were within the scope of license renewal, pursuant to 10 CFR 54.4(a)(1). However, these cooling coils were omitted from LRA Table 2.3.3-4 for components subject to an AMR. The staff requested that the applicant explain why these cooling coils are not included in LRA Table 2.3.3-4.

In its response, dated October 18, 2007, the applicant stated:

> The control structure H/V units 0V103A and 0V103B, including cooling coils 0E146A1 through B2 are within the scope of license renewal and are subject to AMR. Based on PPL's scoping methodology, these cooling coils have been scoped with the control structure HVAC systems and are included in LRA Section 2.3.3.5 and Table 2.3.3-5.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.4-4 acceptable because the applicant adequately explained that the AMR for the cooling coils in question is covered in LRA Section 2.3.3.5 and Table 2.3.3-5. Therefore, the staff's concern described in RAI 2.3.3.4-4 is resolved.

In RAIs 2.3.3.4-5 and 2.3.3.4-6, dated August 27, 2007, the staff noted that the safety-related control room floor recirculation unit cooling coils were within the scope of license renewal in accordance with 10 CFR 54.4(a)(1) criterion. However, these cooling coils were omitted from LRA Table 2.3.3-4 for components subject to an AMR. The staff requested that the applicant explain why these cooling coil components are not included in LRA Table 2.3.3-4.

In its response to RAIs 2.3.3.4-5 and 2.3.3.4-6, dated October 18, 2007, the applicant stated:

> The control room floor recirculation units 0V117A and 0V117B, including cooling coils 0E151A1 through B2, are within the scope of license

renewal and are subject to AMR. Based on PPL's scoping methodology, these cooling coils have been scoped with the Control Structure HVAC Systems and are included in LRA Section 2.3.3.5 and Table 2.3.3-5.

Based on its review, the staff finds the applicant's response to RAIs 2.3.3.4-5 and 2.3.3.4-6 acceptable because the applicant explained that the cooling coils in question are covered in LRA Section 2.3.3.5 and Table 2.3.3-5. Therefore, the staff's concern described in RAIs 2.3.3.4-5 and 2.3.3.4-6 is resolved.

2.3.3.4.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the control structure chilled-water system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the control structure chilled-water system mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.5 Control Structure Heating, Ventilation, and Air Conditioning (HVAC) Systems

2.3.3.5.1 Summary of Technical Information in the Application

LRA Section 2.3.3.5 describes the control structure HVAC systems. The control structure HVAC systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the control structure HVAC system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the control structure HVAC systems perform functions that support EQ. LRA Table 2.3.3-5 identifies control structure HVAC systems component types within the scope of license renewal and subject to an AMR.

2.3.3.5.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the control structure HVAC systems mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.6 Cooling Tower System

2.3.3.6.1 Summary of Technical Information in the Application

LRA Section 2.3.3.6 describes the single-loop cooling tower system consisting of a hyperbolic natural draft cooling tower, cooling tower basin, blowdown and makeup water systems, and chemical and blowdown treatment systems. The cooling tower system dissipates both latent heat from the main condenser and sensible heat from the service water system (SWS). The cooling tower system performs functions that support fire protection. LRA Table 2.3.3-6 identifies cooling tower system component types within the scope of license renewal and subject to an AMR.

2.3.3.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.6, UFSAR Sections 9.2.1 and 10.4.5, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.6-1, dated August 27, 2007, the staff noted that one of the stated purposes of the cooling tower system is to supply water to the fire protection system and therefore, complies with the scoping criteria of 10 CFR 54.4(a)(3). Boundary drawings LR-M-115-1, LR-M-2115-1, and LR-M-109-1 show supply lines from the cooling tower basin to the fire pumps within the scope of license renewal, with a pressure boundary intended function. However, connected piping is not within the scope of license renewal up to the first isolation valve, where it connects to the SW and circulating water pumps. The staff requested that the applicant explain why these sections of pipe and components are not within scope for license renewal.

In its response to RAI 2.3.3.6-1, dated October 18, 2007, the applicant stated:

> The highlighted piping depicts the supply path for water from the cooling tower basins to the fire protection pumps. This supply path meets the criteria of 10 CFR 54.4(a)(3) for fire protection. Inclusion of the connected piping up to the service water and circulating water pump isolation valves in the scope of license renewal is not necessary to ensure that the intended function is maintained.
>
> As described in Section 2.3.3.6 of the LRA, each cooling tower basin contains 6,000,000 gallons of water, and is capable of meeting the largest expected water demands of the fire protection system. As described in Section 4.1 of the Fire Protection Review Report (FPRR), the largest single (fire protection) demand can be satisfied by one fire pump, rated at 2500 gpm. Operability of the fire suppression water supply is controlled in accordance with the SSES Technical Requirements Manual (TRM). The TRM ensures at least one flow path capable of taking suction from any two designated water supplies and an available supply of water, from either the Unit 1 or Unit 2 cooling tower basin or the clarified water storage tank, with a minimum volume of 300,000 gallons. Due to the large volume available from a single cooling tower basin, in relation to the fire protection demand, inclusion of the connected piping up to the service water and circulating water pump isolation valves is not necessary to ensure this secondary supply of fire protection water.
>
> As the fire suppression water supply is maintained operable the connected sections of piping will not affect the intended function of the Cooling Tower System. Therefore, the subject piping is not included within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-1 acceptable because the applicant has clarified that the highlighted piping depicts the supply path for water from the cooling tower basins to the fire protection pumps and is the total piping required for compliance with 10 CFR 54.4(a)(3) for fire protection. The staff reviewed the UFSAR and the Fire Protection Review Report and confirms the applicant's statement. The staff also confirms that there are no hypothetical failures resulting from system interdependencies that would affect this piping identified in the CLB and none has been previously experienced. Therefore, the staff's concern described in RAI 2.3.3.6-1 is resolved.

In RAI 2.3.3.6-2, dated August 27, 2007, the staff noted that one of the stated purposes of the cooling tower system is to supply water to the fire protection system and therefore, complies with the scoping criteria of 10 CFR 54.4(a)(3). Boundary drawings LR-M-115-1, LR-M-2115-1, and LR-M-109-1 show supply lines from the cooling tower basin to the fire pumps as within the scope of license renewal, with a pressure boundary intended function. However, boundary drawing LR-M-2115-1, location A4, and the continuation onto boundary drawing LR-M-2109-1, location D1, shows the supply line to the SWS is not within the scope of license renewal. The staff requested that the applicant explain why these sections of pipe and components are not within scope of license renewal.

In its response to RAI 2.3.3.6-2, dated October 18, 2007, the applicant stated:

> The highlighted piping depicts the supply path for water from the cooling tower basins to the fire protection pumps. This supply path meets the criteria of 10 CFR 54.4(a)(3) for fire protection.
>
> As described in response to RAI 2.3.3.6-1, each cooling tower basin contains a large volume (6,000,000 gallons) of water available for fire protection. This secondary volume is significantly more than is required for fire suppression since the largest single (fire protection) demand can be satisfied by one fire pump, rated at 2500 gpm. As such, the volume contained in the connected piping up to the service water and circulating water pump isolation valves is inconsequential to the fire water supply and only the path from the cooling tower basin to the fire pumps is required for the intended function. Therefore, the path is included in the license renewal evaluation boundary but the connected piping to service water and circulating water pump isolation valves are not.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-2 acceptable because the applicant has clarified that the highlighted piping depicts the supply path for water from the cooling tower basins to the fire protection pumps and is the total piping required for compliance with 10 CFR 54.4(a)(3) for fire protection. The staff's review of the UFSAR and Fire Protection Review Report confirms the applicant's clarification. The staff also confirms that there are no hypothetical failures resulting from system interdependencies that would affect this piping identified in the current licensing bases and none has been previously experienced. Therefore, the staff's concern described in RAI 2.3.3.6-2 is resolved.

2.3.3.6.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the cooling tower system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the control cooling tower system mechanical components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.7 Diesel Fuel Oil System

2.3.3.7.1 Summary of Technical Information in the Application

LRA Section 2.3.3.7 describes the diesel fuel oil system, which stores onsite and delivers fuel oil to the DGs for at least seven days of operation. The diesel fuel oil system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the diesel fuel oil system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the diesel fuel oil system performs functions that support fire protection, ATWS, and SBO. LRA Table 2.3.3-7 identifies diesel fuel oil system component types within the scope of license renewal and subject to an AMR.

2.3.3.7.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.7, UFSAR Section 9.5.4, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.7-1, dated August 27, 2007, the staff noted that the injector housing is a component for the diesel fuel oil system that is usually included within the scope of license renewal and subject to an AMR. The impulse pumps shown on boundary drawings LR-M-134-1, location E5, and LR-M-134-7, location A2, are not shown within the scope of license renewal and the impulse pump housing is not listed in LRA Table 2.3.3-7 for components subject to an AMR. The staff requested that the applicant explain why the impulse pumps and fuel injector housings are not within the scope of license renewal and not included in LRA Table 2.3.3-7 as a component type subject to AMR.

In its response to RAI 2.3.3.7-1, dated October 18, 2007, the applicant stated that a re-evaluation of the fuel injection pumps determined that these pumps are subject to an AMR. LRA Tables 2.3.3-7 and 3.3.2-7 were amended to include the fuel injection pumps. The applicant explained that the fuel injectors are mounted in the engine cylinder and considered active components; therefore, the fuel injectors are not subject to AMR.

The staff finds the applicant's response to RAI 2.3.3.7-1 acceptable because the applicant has amended the LRA to add the fuel injection pump housing as a component type subject to AMR and has adequately explained why the fuel injectors are not a component type subject to AMR. Therefore, the staff's concern described in RAI 2.3.3.7-1 is resolved.

In RAI 2.3.3.7-2, dated August 27, 2007, the staff noted that the DG day tank flame arrestors shown on boundary drawings LR-M-134-1, location F8, and LR-M-134-7, location A8, are within the scope of license renewal, but are not included in LRA Table 2.3.3-7 for component types subject to an AMR. The flame arrestor is typically a component type subject to an AMR. The flame arrestors are shown within the scope of license renewal for different reasons on these two boundary drawings. The staff requested that the applicant explain why the flame arrestors are shown within the scope of license renewal, but not included in LRA Table 2.3.3-7, and why the flame arrestors are shown within the scope of license renewal for different reasons.

In its response to RAI 2.3.3.7-2, dated October 18, 2007, the applicant stated in part:

> As shown on license renewal drawings LR-M-134-1 and LR-M-134-7-4, the vent line piping for the diesel fuel oil day tanks is within the scope of license renewal.
>
> The vent lines for day tanks for diesels A-D on drawing LR-M-134-1 are shown as cross-hatched, which indicates a safety-related process line per the legend drawing LR-M-100-2. This is supported by the HBC line designation which indicates that the piping is classified as ASME Section III Class 3. Therefore, the vent lines are within the scope of license renewal and are highlighted in green per LR-M-100-4 Note A2.
>
> The flame arrestors on the A-D diesel day tank vent lines on drawing LR-M-134-1 are not classified as safety-related. Drawing LR-M-134-1 has been revised to include the flame arrestors within the scope of license renewal per the criteria of 10 CFR 54.4(a)(2).
>
> The vent lines for the E diesel day tank on drawing LR-M-134-7 are nonsafety-related but are seismically qualified. This is supported by the HBD line designation which indicates that the piping is classified as ANSI B31.1.0. FSAR Table 3.2-1 supports the determination that the day tank vent lines are not safety-related. Per FSAR Section 9.5.4.3, the diesel generator fuel oil system is Seismic Category I. Therefore, the vent lines are within the scope of license renewal and are highlighted in pink (magenta) per LR-M-100-4 Note A2 up to the point where they exit the diesel generator building as they have the potential for spatial interaction with safety-related components. The boundary is extended through the end of the vent piping for the day tank, including the flame arrestor.
>
> The vent piping and flame arrestors perform a structural integrity function and are evaluated under the component type of “piping and piping components.” In PPL’s response to RAI 2.1-3, LRA Table 2.3.3-7 was amended to include a line item for piping and piping components which perform a structural integrity function. The PPL response to RAI 2.1-3, (Reference 3), also amended LRA Table 3.3.2-7 to include the aging management evaluation for carbon steel piping and piping components subject to an internal ventilation environment and an external outdoor air environment. No further changes to LRA Table 2.3.3-7 or Table 3.3.2-7 are required in response to this RAI.

The staff confirms that the applicant has submitted revised boundary drawings LR-M-134-1 and LR-M-134-7 and also a revision to note 0361 in LRA Section 3.3 to address the response to this RAI.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-2 acceptable because the applicant satisfactorily explained why in-scope flame arrestors are not included in LRA Table 2.3.3-7 and why flame arrestors are shown within the scope of license renewal for different reasons. The staff confirms that the applicant has made appropriate revisions to boundary drawings LR-M-134-1 and LR-M-134-7 and added plant-specific note 0361 to the LRA. Therefore, the staff's concern described in RAI 2.3.3.7-2 is resolved.

In RAI 2.3.3.7-3, dated August 27, 2007, the staff noted that DG fuel oil storage tank flame arrestors are shown on boundary drawings LR-M-120-1, locations B3, D3, E3, and G3, and LR-M-120-2, location F3 to C3. The flame arrestors are not shown within the scope of license renewal. Flame arrestors are typically included within the scope of license renewal because they are classified as a component subject to an AMR within the pressure boundary for the diesel fuel oil tanks. The staff requested that the applicant explain why the flame arrestors are not within the scope of license renewal.

In its response to RAI 2.3.3.7-3, dated October 18, 2007, the applicant stated:

> As shown on license renewal drawings LR-M-120-1 and LR-M-120-2, the vent line piping and the associated flame arrestors for the diesel fuel oil storage tanks are not within the scope of license renewal. The vent lines extend from the top of the storage tank within the buried vault to above ground where the piping is goose-necked and provided with flame arrestors. The vent piping is located above the fuel oil level within the storage tanks and therefore does not provide a pressure boundary function.
>
> The vent lines for the diesel fuel oil storage tanks on drawing LR-M-120-1 and LR-M-120-2 are nonsafety-related but are seismically qualified. This is supported by the HBD line designation which indicates that the piping is classified as ANSI B31.1.0. FSAR Table 3.2-1 supports the determination that the storage tank vent lines are not safety-related. Per FSAR Section 9.5.4.3, the diesel generator fuel oil system is Seismic Category I.
>
> The flame arrestors on the diesel storage tank vent lines are not classified as safety-related. FSAR Section 9.5.4.2 states for the fuel oil storage tank vent line that if the above grade section of the vent is damaged, it would not render the fuel oil storage tank inoperable. This determination also applies to the flame arrestors located above grade on the vent piping. The flame arrestors do not perform a license renewal intended function. In addition, the vent line and flame arrestor do not provide any support for the safety-related tank to which they are attached. Therefore, the flame arrestors on the diesel fuel oil storage tank vent lines are not within the scope of license renewal.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.7-3 acceptable because the applicant satisfactorily explained why these diesel fuel oil tank vent lines and flame arrestors are not within the scope of license renewal. Therefore, the staff’s concern described in RAI 2.3.3.7-3 is resolved.

In RAI 2.3.3.7-4, dated August 27, 2007, the staff noted that the DG storage tank manhole covers shown in boundary drawing LR-M-120-1, locations B2, D2, F3, and G3, are not shown within the scope of license renewal. The staff requested that the applicant explain why the manhole covers are not shown within the license renewal scope boundary.

In its response to RAI 2.3.3.7-4, dated October 18, 2007, the applicant stated:

> The diesel generator storage tank manholes and covers shown on drawing LR-M-120-1 are within the scope of license renewal. A highlighting error resulted in the manholes and covers on drawing LR-M-120-1 not being indicated as within the scope of license renewal.
>
> The manholes and covers are considered to be part of the pressure boundary of the storage tanks. This is reflected by the highlighting of the manholes and covers for the E diesel generator storage tank on drawing LR-M-120-2.
>
> No changes are required to Table 2.3.3-7 or Table 3.3.2-7, the manholes are included in the line item for “Tanks (0T527A-E, 0T528A-E)”. The component types are therefore subject to aging management review and have been evaluated with the storage tanks.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-120-1.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.7-4 acceptable because the applicant has clarified that the manhole covers are within the scope of license renewal and has made the appropriate revisions to boundary drawing LR-M-120-1. Therefore, the staff’s concern described in RAI 2.3.3.7-4 is resolved.

In RAI 2.3.3.7-5, dated August 27, 2007, the staff noted that boundary drawing LR-M-120-1, locations B7, D7, E7, and G7, indicate that there are manhole covers on top of the DG day tanks A, B, C, and D. However, boundary drawing LR-M-134-1, location F8, does not show a manhole cover on the top of DG day tanks A, B, C, and D. The staff requested that the applicant explain whether or not there are manhole covers on the four tanks and whether there are manhole covers on these tanks, explain why they are not shown on boundary drawing LR-M-134-1 and why they are not within the scope of license renewal.

In its response to RAI 2.3.3.7-5, dated October 18, 2007, the applicant stated:

> As stated in FSAR Section 9.5.4.2, a manhole is provided on each diesel generator fuel oil day tank for inspection. The manholes are depicted on license renewal drawing LR-M-120-1 due to space limitations on drawing LR-M-134-1. The dashed lines for tanks 0T528A, B, C, and D on drawing LR-M-120-1 indicate that the components are represented on another

> drawing (LR-M-134-1). The manholes and covers associated with the diesel generator fuel oil day tanks on LR-M-120-1 are solid lines indicating that they are represented on drawing LR-M-120-1.
>
> It was determined that the diesel generator day tank manholes and covers shown on drawing LR-M-120-1 should be shown as within the scope of license renewal. The manholes and covers are part of the pressure boundary of the storage tanks.
>
> No changes are required to Table 2.3.3-7 or Table 3.3.2-7. The manholes and covers for the diesel generator day tank shown in drawing LR-M-134-7 are shown within the license renewal evaluation boundary. The component types are therefore subject to aging management review and have been evaluated with the tanks.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-120-1.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.7-5 acceptable because the applicant: (a) clarified that the manhole covers are within the scope of license renewal, (b) explained why the manhole covers were not shown on boundary drawing LR-M-134-7, and (c) made the appropriate revisions to boundary drawing LR-M-120-1. Therefore, the staff’s concern described in RAI 2.3.3.7-5 is resolved.

In RAI 2.3.3.7-6, dated August 27, 2007, the staff noted that boundary drawing LR-M-134-7, location A6, indicates that there is a manhole cover on top of the DG day tank E and that it is within the scope of license renewal. The staff requested that the applicant explain why the manhole cover is not listed in LRA Table 2.3.3-7 for components subject to an AMR.

In its response to RAI 2.3.3.7-6, dated October 18, 2007, the applicant stated:

> The manhole and cover depicted on license renewal drawing LR-M-134-7 is within the scope of license renewal. The manhole and cover are considered to be an integral part of the tank component. Therefore, the “Tanks (0T527A-E, 0T528A-E)” entry in Table 2.3.3-7 includes the associated manholes and covers. The manhole and cover perform the same pressure boundary function as the tank.

Based on its review, the staffs finds the applicant’s response to RAI 2.3.3.7-6 acceptable because the applicant has explained that the manholes and covers are within the scope of license renewal and are an integral part of the tank component type listed in LRA Table 2.3.3-7. Therefore, the staff’s concern described in RAI 2.3.3.7-6 is resolved.

2.3.3.7.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff’s review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the diesel fuel oil system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the control diesel fuel oil system mechanical components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.8 Diesel Generator Building HVAC Systems

2.3.3.8.1 Summary of Technical Information in the Application

LRA Section 2.3.3.8 describes the diesel generator (DG) building HVAC systems, which maintain a suitable environment for the DGs during all modes of operation. The DG buildings HVAC systems contain safety-related components relied upon to remain functional during and following DBEs. In addition, the DG buildings HVAC systems perform functions that support fire protection. LRA Table 2.3.3-8 identifies DG buildings HVAC systems component types within the scope of license renewal and subject to an AMR.

2.3.3.8.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the DG building HVAC systems mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.9 Diesel Generator System

2.3.3.9.1 Summary of Technical Information in the Application

LRA Section 2.3.3.9 describes the DGs system consisting of five DGs, only four of which can be aligned to the safety-related load groups. The DGs system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the DGs system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the DGs system performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.3-9 identifies DGs system component types within the scope of license renewal and subject to an AMR.

2.3.3.9.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the DG system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.10 Domestic Water System

2.3.3.10.1 Summary of Technical Information in the Application

LRA Section 2.3.3.10 describes the domestic water system, which provides cold and hot water acceptable for human consumption to plumbing fixtures for the entire plant. The failure of nonsafety-related SSCs in the domestic water system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-10 identifies domestic water system component types within the scope of license renewal and subject to an AMR.

2.3.3.10.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the domestic water system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.11 Emergency Service Water System

2.3.3.11.1 Summary of Technical Information in the Application

LRA Section 2.3.3.11 describes the ESW system consisting of two loops, each designed to supply simultaneously 100 percent of the ESW requirements to both units and to the common emergency DGs. The ESW system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the ESW system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the ESW system performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.3-11 identifies ESW system component types within the scope of license renewal and subject to an AMR.

2.3.3.11.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.11, UFSAR Section 9.2.5, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.11-1, dated August 27, 2007, the staff noted that boundary drawings LR-M-186-3 and LR-M-186-4 depict ESW piping to and from the ESW bundles (OS117A2 and OS117B2). LRA Section 2.3.3.11, "Emergency Service Water System," paragraph titled "Drawings" does not include LR-M-186-3 or LR-M-186-4 for Unit 1, as applicable boundary drawings. The staff requested that the applicant clarify that ESW piping to and from the ESW bundles (OS117A2 and OS117B2) is within the ESW system and whether boundary drawings LR-M-186-3 and LR-M-186-4 are applicable references in LRA Section 2.3.3.11.

In its response to RAI 2.3.3.11-1, dated October 18, 2007, the applicant stated in part:

> The ESW piping to and from the ESW bundles (0S117A2 and 0S117B2) shown on LR-M-186-3 and LR-M-186-4, respectively, is within the scope of license renewal and subject to AMR. This ESW piping to and from the ESW bundles is scoped as part of the Control Structure Chilled Water System, rather than as part of ESW, and is included in LRA Section 2.3.3.4 and associated Table 2.3.3-4. Therefore, drawings LR-M-

> 186-3 and LR-M-186-4 are not applicable references for LRA Section 2.3.3.11.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.11-1 acceptable because the applicant has clarified that the piping in question is within the scope of license renewal as part of the control structure chilled water system rather than the ESW system. Therefore, the staff's concern described in RAI 2.3.3.11-1 is resolved.

In RAI 2.3.3.11-2, dated August 27, 2007, the staff noted that LRA Table 2.3.3-11, "Emergency Service Water System Components Subject to Aging Management Review," does not contain flexible connectors as a component type subject to AMR. The staff requested that the applicant explain why the flexible connectors are not listed as components subject to an AMR in LRA Table 2.3.3-11.

In its response to RAI 2.3.3.11-2, dated October 18, 2007, the applicant stated in part that the room unit coolers listed in RAI 2.3.3.11-2:

> …are in the scope of license renewal and are subject to AMR. The flexible connections associated with each unit cooler are scoped in the same system as the unit cooler itself, not in the ESW system. Based on PPL's scoping methodology, these unit coolers, including the flexible connections associated with them, are all scoped with the Reactor Building HVAC System. The flexible connections are included in LRA Section 2.3.3.24 and the associated Table 2.3.3-23.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.11-2 acceptable because the applicant has clarified that the flexible connections in question are within the scope of license renewal and subject to AMR, but are part of the RB HVAC system rather than the ESW system. Therefore, the staff's concern described in RAI 2.3.3.11-2 is resolved.

2.3.3.11.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the emergency SWS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the emergency SWS mechanical components subject an AMR in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.12 Engineered Safeguards (ES) Service Water (SW) Pumphouse HVAC System

2.3.3.12.1 Summary of Technical Information in the Application

LRA Section 2.3.3.12 describes the ESSW pumphouse HVAC system, which maintains a suitable environment in the pumphouse for the emergency service water (ESW) and RHRSW system pumps and their appurtenances. The ES SW pumphouse HVAC system contains safety-related components relied upon to remain functional during and following DBEs. In addition, the ES SW pumphouse HVAC system performs functions that support fire protection. LRA Table 2.3.3-12 identifies ES SW pumphouse HVAC system component types within the scope of license renewal and subject to an AMR.

2.3.3.12.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the ESSW pumphouse HVAC system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.13 Fire Protection System

2.3.3.13.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13 describes the fire protection system, which minimizes both the probability and consequences of postulated fires. The fire protection system contains nonsafety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the fire protection system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the fire protection system performs functions that support fire protection. LRA Table 2.3.3-13 identifies fire protection system component types within the scope of license renewal and subject to an AMR.

2.3.3.13.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13, UFSAR Section 9.5.1, the Fire Protection Review Report and the following fire protection CLB documents, using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3:

- NUREG-0776, “Safety Evaluation Report Related to the Operation of Susquehanna Steam Electric Station, Units 1 and 2,” April 1981
- NUREG-0776, Supplement No. 1, June 1981
- NUREG-0776, Supplement No. 2, September 1981
- NUREG-0776, Supplement No. 3, July 1982
- NUREG-0776, Supplement No. 4, November 1982
- NUREG-0776, Supplement No. 6, March 1984
- Safety Evaluation of Fire Protection Report, August 9, 1989
- Safety Evaluation of Revision 4 to the Fire Protection Review Report, March 29, 1993
- Safety Evaluation of Fire Protection Program Issues, Safe-Shutdown Methodology and Analysis of Associated Circuits dated October 21, 1997
- Safety Evaluation of the Licensees’ Amendment No. 177, June 24, 1989

In conducting 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 had not omitted from the scope of license renewal any components with intended functions pursuant to 10 CFR 54.4(a). The staff then reviewed those components the applicant identified as being within the scope of license renewal to verify that the applicant had not omitted any passive or long-lived components subject to an AMR in accordance with 10 CFR 54.21(a)(1).

The staff also reviewed the applicant's commitments to 10 CFR 50.48, "Fire protection" (*i.e.*, approved fire protection program), using the applicant's commitment documents to the Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," May 1, 1976, and Appendix A to BTP APCSB 9.5-1, August 23, 1976, documented in the Fire Protection Review Report.

The staff's review of LRA Section 2.3.3.13 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.13-1, dated June 22, 2007, the staff noted the LRA boundary drawing LR-M-122, Sheet No. 1, "Fire Pumphouse, North & South Gatehouse & Security Control Center Buildings," shows the jockey pump and associated components as not within the scope of license renewal (i.e., not colored in green). SER Section 9.5.1.1 (NUREG-0776), dated April 1981, states that a separate jockey pump automatically maintains the yard fire main pressure. The jockey pump and its associated components appear to have fire protection intended functions required for compliance with 10 CFR 50.48, pursuant to 10 CFR 54.4(a)(3). The staff requested that the applicant verify whether the jockey pump and its associated components are within the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR, in accordance with 10 CFR 54.21(a)(1) and; if excluded, provide justification.

In its response to RAI 2.3.3.13-1, dated July 24, 2007, the applicant stated in part:

> The jockey fire pump and associated components, shown on LRA boundary drawing LR-M-122, Sheet 1, are not in the scope of license renewal and, therefore, are not subject to an AMR. The jockey pump does not have fire protection intended functions required for compliance with 10 CFR 50.48.

In evaluating the applicant's response to RAI 2.3.3.13-1, the staff found it was incomplete and that review of LRA Section 2.3.3.13 could not be completed. The staff notes the applicant's statement that the jockey pump does not have fire protection intended functions required for the compliance with 10 CFR 50.48. However, the staff finds this statement contrary to the applicant's fire protection commitment to BTP APCSB 9.5-1, Appendix A, documented in SER Section 9.5.1.1 (April 1981), which is used as the CLB. The commitment states in part, "a separate jockey pump automatically maintains yard main pressure from 105 to 125 psi. The fire pumps start automatically on low header pressure."

The applicant indicated in its response to RAI 2.3.3.13-1 that the jockey pump in question, was not within the scope of license renewal because the jockey pump is not required to function to suppress a fire or supply required fire protection water. Therefore, the applicant used criteria pursuant to 10 CFR 54.4(a)(2) to exclude the jockey pump. Since there is no adverse effect due to the jockey pump failure, the applicant excludes this component on that basis, and has neglected the fact that this component is relied upon to comply with 10 CFR 50.48 (pursuant to the CLB), as stated in 10 CFR 54.4(a)(3).

The staff held a telephone conference with the applicant on October 3, 2007, to discuss information necessary to resolve its concern in RAI 2.3.3.13-1. During the teleconference, the staff explained that the scope of SSCs required for compliance with 10 CFR 50.48 and 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 3, goes beyond preserving the ability to maintain safe-shutdown in the event of a fire. The staff stated that exclusion of fire protection SSCs, on the basis that the intended function is not required for the protection of safe-shutdown equipment or safety-related equipment, is not acceptable, whether the SSC is required for compliance with 10 CFR 50.48.

The applicant's CLB demonstrates that, in accordance with GDC 3, this component was credited to meet the guidance of BTP APCSB 9.5-1, Appendix A. Therefore, the jockey pump in question should not be excluded from the scope of license renewal. In addition, this component should not be excluded on the basis that it is not required to function to suppress a fire, without factoring in the CLB, nor is it required for compliance with 10 CFR 50.48.

By letter dated October 24, 2007, the applicant responded in part that "Based on discussion with the NRC, the jockey fire pump and associated components, shown on LRA boundary drawing LR-M-122, Sheet 1, have been included within the scope of license renewal, and are subject to an AMR."

The staff confirms that the applicant has submitted revised boundary drawing LR-M-122-1 and has amended LRA Tables 2.3.3-13 and 3.3.2-13 to include the jockey fire pump and associated components as within the scope of license renewal and subject to an AMR

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-1 acceptable because the applicant has committed to meet the CLB based on the guidance of Appendix A of BTP APCSB 9.5-1. The staff is adequately assured that the jockey pump and associated components used for the fire suppression will be appropriately considered during aging management activities. Therefore, the staff's concern described is RAI 2.3.3.13-1 is resolved.

In RAI 2.3.3.13-2, dated June 22, 2007, the staff noted the following LRA boundary drawings show fire protection system components as not within the scope of license renewal (*i.e.*, not colored in green):

- LR-M-122 Sheet 1, "Fire Pumphouse, North & South Gatehouse & Security Control Center Buildings," shows Diesel Oil Day Tank (0T508) vent line and the fill cap-assembly line, piping, fittings, and drains as out of scope (i.e., not colored in green)
- LR-M-122 Sheet 2, "Turbine Bldg.(TB), Control Structure and Radwaste Building," shows several fire suppression systems and components in TB for Units 1 and 2 as out of scope (i.e., not colored in green)
- LR-M-122 Sheet 3, "Reactor Bldg., Standby D G, River Intake Structure Service and Admin. Bldg. & Circ. Water Pumphouse " shows several fire suppression systems and components in TB for Units 1 and 2, as out of scope (i.e., not colored in green)
- LR-M-122 Sheet 4, "Carbon Dioxide System," shows several components as out of scope (i.e., not colored in green)

The staff requested that the applicant verify whether the above fire suppression systems and components are within the scope of license renewal, in accordance with 10 CFR 54.4(a) and subject to an AMR, in accordance with 10 CFR 54.21(a)(1) and; if not, provide justification for the exclusion.

In its response to RAI 2.3.3.13-2, dated July 24, 2007, the applicant stated:

> <u>LR-M-122 Sheet 1</u>
> The Diesel Oil Day Tank (0T508) vent line and the fill cap-assembly line, piping, fittings, and drains have no license renewal function, are not in license renewal scope and are not subject to AMR. These vent and fill lines, as well as the return (drain) line from the diesel engine to the tank, are above the tank's normal oil level and the tank is vented to atmosphere. As described in the FPRR, the tank contains enough diesel fuel oil for 8 hours of operation in accordance with NFPA 20. Failure of these components will not create a leakage path that would drain the tank and will not prevent the diesel fire pump from accomplishing its Appendix R function.
>
> The components that do have a license renewal intended function in support of the diesel engine driven fire pump, the day tank, tubing and flexible connections, as well as the drain line and valve for the day tank, 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), as listed in LRA Table 2.3.3-13 and shown (highlighted in green) on LRA drawing LR-M-122 Sheet 1.
>
> <u>LR-M-122 Sheet 2</u>
> As stated in LRA Section 2.1.1.2.2, no components in the TB either perform a safety function or would prevent a safety-related function from occurring. With few exceptions, there are no fire suppression systems or components in the TB that are credited with protection of safety-related or safe shutdown equipment.
>
> LRA Section 2.1.1.3.1 discusses scoping of the fire protection system to achieve and maintain safe shutdown; that is features required for fire protection of safety-related equipment and any system function that were included in, or provide necessary support for, one or more of the three (3) safe shutdown paths credited for compliance with Appendix R. SSCs that perform an intended function for fire protection are included in the scope of license renewal. These include certain hose stations (1/2HR-101 and 1/2HR-156) and sprinkler systems (e.g., DS-0 15, PA-091, PA-092, and PA-1/26 1), which are shown as being located in the TB on LRA drawing LR-M-122 Sheet 2, and are credited with protection of control structure and transformer yard components. Section 3.7.3.5 and 3.7.3.2 of the Technical Requirements Manual (TRM) identify the fire hose stations and the spray and sprinkler systems, respectively, that are credited for safety-related and safe-shutdown protection.
>
> Except for the header piping and components and those suppression systems and components discussed above, the remaining suppression systems and components in the TB are not credited for safety-related or safe-shutdown fire protection. Therefore, except as indicated above and

on LRA Drawing LR-M-122 Sheet 2, the fire suppression systems and components located in the TB are not in license renewal scope and are not subject to an AMR.

LR-M-122 Sheet 3
As described above in response to the question on LR-M-122, Sheet 2, the suppression systems and components that are credited for safety-related and safe-shutdown protection are in the scope of license renewal. This includes fire hydrant FH-104, which is credited with protection of diesel generator building components, and suppression station DS-014, which is credited for protection of a transformer adjacent to the Circ. Water Pumphouse. Except as noted, neither the Turbine Building, Circ. Water Pumphouse nor River Intake Structure facilities contain safety-related equipment or equipment relied upon by the safe shutdown analysis. The applicant stated that, therefore, except as noted above, the fire suppression systems and components in these structures do not satisfy the requirements of 10 CFR 54.4, are not in license renewal scope and are not subject to an AMR.

LR-M-122 Sheet 4
While it is briefly mentioned in NUREG-0776 Section 9.5.1.3, the generator purge portion of the carbon dioxide system is not credited with safety-related or safe-shutdown protection. As such, there are two pipe sections in the lower, left hand comer of drawing LR-M-122, Sheet 4, that are not in the scope of license renewal. The “fill line” and the “equalizing line” for generator purge are isolated from the CO_2 storage tank by normally closed valves and do not have a license renewal function. The applicant stated that, therefore, neither portion of the piping and associated components is in license renewal scope (*i.e*., is not highlighted in green).

Valves PSV02269, PSV02270, PSV02271 and the piping between those valves and valve 022978 have conservatively been highlighted green as in-scope and subject to an AMR. The piping is carbon steel and the valves are bronze. In addition the piping from valve 022979 through 0CB650 is in-scope and subject to an AMR, but was inadvertently not highlighted. Both portions of pipe have been highlighted green on the revised boundary drawing in the attachment to this letter. No changes to the LRA are required as the material/environment combinations of this additional highlighting are already covered in Table 3.3.2-13.

In evaluating the applicant’s response to RAI 2.3.3.13-2, the staff found it was incomplete and that review of LRA Section 2.3.3.13 could not be completed. The applicant explained in its response that the fire protection SSCs in question are not credited for safety-related and safe-shutdown. Exclusion of fire protection SSCs on the basis that its intended function is not required for the protection of safe-shutdown equipment or safety-related equipment is not acceptable, whether that SSC is required for compliance with 10 CFR 50.48 (*i.e*., required to meet Appendix A to BTP APSCB 9.5-1). Therefore, the staff concludes that these components should be included within the scope of license renewal and subject to an AMR. The staff held a telephone conference with the applicant on October 3, 2007, to discuss information necessary to resolve the staff's concern described in RAI 2.3.3.13-2.

The staff explained that the scope of fire protection SSCs discussed above were excluded on the basis that they were not "protecting" safety-related or safe-shutdown equipment, even though they were accepted for compliance with the provisions of Appendix A to BTP APSCB 9.5-1. Furthermore, the scoping requirements of 10 CFR 54.4 states that SSCs are included in-scope, which demonstrate compliance with 10 CFR 50.48. Therefore, if the SSCs were installed in compliance with 10 CFR 50.48, then they should be included within the scope of license renewal.

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

In its response, dated October 24, 2007, the applicant stated, in part, that in LRA boundary drawing LR-M-122, Sheet 1, "The Diesel Oil Day Tank (0T508) vent line and the fill cap-assembly line, piping, fittings, and drains have no license renewal function, are not in license renewal scope and are not subject to AMR." Further, the applicant stated that the LRA boundary drawings LR-M-122, Sheet 2 and LR-M-122, Sheet 3 (Turbine Building, Circ. Water Pumphouse, and River Intake Structure fire suppression systems and components) in question were for loss prevention and insurance purposes. Turbine Building fire suppression systems do not protect safety-related equipment, nor are addressed in PPL's response to BTP APSCB 9.5-1, Revision 0, Appendix A, and are not credited in the 10 CFR Part 50, Appendix R safe-shutdown analysis.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-2 acceptable because the applicant has adequately explained that the fire suppression systems and components in question are not credited for 10 CFR 50.48 and GDC 3. The staff confirms that these fire water suppression systems are for property protection and for loss prevention. The staff determines that the applicant correctly excluded the fire suppression systems and components in question on the basis that they are not required for compliance with 10 CFR 50.48. The staff notes the applicant's interpretation of these components as active (short-lived components), which necessarily will result in more vigorous oversight of the condition and performance of the components. The applicant concurs. Further, the staff notes that the applicant has considered certain fire protection systems and components as only required to protect nonsafety-related equipment and; thus, satisfies requirements of the plant insurance carrier. The staff concludes that these fire protection systems and components were correctly excluded from the scope of license renewal and from being subject to an AMR. Therefore, the staff's concerns described in RAI 2.3.3.13-2 are resolved.

In RAI 2.3.3.13-3, dated June 22, 2007, the staff stated that SER Section 9.5.1.2 (NUREG-0776, dated April 1981), listed sprinkler and standpipe systems provided in the plant areas for fire suppression activities. These systems were installed in the following areas:

- Reactor Core Isolation Cooling Pump Room
- High Pressure Coolant Injection Pump Room
- Heating, Ventilation, and Air-Conditioning Filter Rooms
- Railroad Airlock
- Control Building Auxiliary Rooms
- Condenser Area
- Reactor Feed Pump Turbine
- Turbine Central Area
- Turbine Condenser Gallery
- Turbine Hydro Control Power Room
- North Railroad Bay
- Turbine Condenser Mezzanine
- Diesel Engine Fire Pump Room
- Lower Cable Spreading Room (CSR)
- Upper CSR
- RFP Turbine Room
- Diesel Generator Building
- Charcoal Filters
- Standby Gas Treatment Filters
- Emergency Outside Air Filters
- Centrifuge & Conditioner
- Turbine Pump Area
- Turbine Hydro Seal Oil Unit
- Turbine Lube Oil Area
- Turbine Motor Generator Area
- Turbine Filter Room
- Turbine Moisture Separation Area
- Radwaste Tank Vent Filter Room
- Radwaste Auxiliary Rooms
- Radwaste Controlled Zone Shop

The staff requested that the applicant verify whether the sprinkler and standpipe systems installed in the above areas of the plant 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) and; if excluded, provide justification.

In its response to RAI 2.3.3.13-3, dated July 24, 2007, the applicant stated:

> The fire sprinkler and standpipe systems installed in the locations noted by this RAI are listed in two groups below. The first group includes those systems which are in the scope of license renewal and subject to an

AMR. The second group includes those systems that are not within the scope of license renewal and are not subject to an AMR, for which justification is provided.

The sprinkler and standpipe systems for the following areas are in the license renewal scope, and are subject to an AMR. The fire protection components associated with these systems are addressed in the LRA in Sections 2.3.3.13, 3.3.2.1.13, Tables 2.3.3-13 and 3.3.2-13. In addition, the table below lists the boundary drawing, with coordinates, on which the related sprinkler and/or standpipe is shown as in-scope (highlighted in green).

Location	LRA Drawing (Coordinates)
Reactor Core Isolation Cooling Pump Room	LR-M-122, Sheet 3 (B4, B5)
High Pressure Coolant Injection Pump Room	LR-M-122, Sheet 3 (C4, B5)
Heating, Ventilation, and Air-Conditioning Filter Rooms	LR-M-122, Sheets 3 (A4, B4, A5, B5)
Railroad Airlock	LR-M-122, Sheet 3 (D5)
Control Building Auxiliary Rooms	LR-M-122, Sheet 2 (F4, F5)
Lower Cable Spreading Room (CSR)	LR-M-122, Sheet 2 (F3, F5)
Upper CSR	LR-M-122, Sheet 2 (F3, F6)
Diesel Generator Building	LR-M-122, Sheet 3 (C8, D8, E7)
Charcoal Filters	LR-M-122, Sheet 3 (A4, B4, A5, B5)
Standby Gas Treatment Filters	LR-M-122, Sheet 2 (G6), LR-VC-175, Sheet 3
Emergency Outside Air Filters	LR-M-122, Sheet 2 (G6), LR-VC-178, Sheet 1

The sprinkler and standpipe systems for the following areas are not in the license renewal scope and are not subject to an AMR. Except for the diesel engine fire pump room, these sprinkler and standpipe systems are located in the TB and the radwaste building. Consistent with the guidelines of Appendix A to BTP APSCB 9.5-1, the diesel engine driven and motor driven fire pumps are located in rooms separated by a three hour fire wall. In particular, the diesel engine driven fire pump is located in a room enclosed by three hour fire rated walls, doors, and duct penetrations; whereas the motor driven fire pump is located in the main pump room with the service water pumps and circulating water pumps.

This area (fire area A-I) has a low combustible loading. The sprinkler and standpipe systems in following areas do not protect safety-related equipment and are not credited in the Appendix R safe shutdown analysis:

- Condenser Area
- Reactor Feed Pump Turbine
- Turbine Central Area
- Turbine Condenser Gallery
- Turbine Hydro Control Power Room
- North Railroad Bay
- Turbine Condenser Mezzanine
- Diesel Engine Fire Pump Room
- PFP Turbine Room*
- Centrifuge & Conditioner
- Turbine Pump Area
- Turbine Hydro Seal Oil Unit
- Turbine Lube Oil Area
- Turbine Motor Generator Area
- Turbine Filter Room
- Turbine Moisture Separation Area
- Radwaste Tank Vent Filter Room
- Radwaste Auxiliary Rooms
- Radwaste Controlled Zone Shop

Evaluated as the "Reactor Feed Pump (RFP) Turbine Room"

In evaluating the applicant's response to RAI 2.3.3.13-3, the staff found that it was incomplete and that review of LRA Section 2.3.3.13 could not be completed. The staff notes the applicant's explanation that the sprinkler and standpipe systems in the areas listed above do not support SSES post-fire safe-shutdown requirements. The staff finds the applicant's explanation contrary to the April 1981 SSES fire protection SER, as the CLB. The staff held a telephone conference with the applicant on October 3, 2007, to discuss information necessary to resolve the staff's concern described in RAI 2.3.3.13-3. During the teleconference, the staff noted that the applicant had committed to satisfy BTP APCSB 9.5-1, Appendix A, Regulatory Position A.4, "Fire Suppression Systems," by providing certain equipment for the fire protection program that is also considered "important to safety."

The staff found that the applicant's analysis of fire protection regulations does not completely capture the fire protection SSCs required for compliance with 10 CFR 50.48. The scope of SSCs required for compliance to 10 CFR 50.48 and GDC 3 goes beyond preserving the ability to maintain safe-shutdown in the event of a fire. GDC 3 states in part, that "fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety." Furthermore, the general requirements provided in GDC 3 to "minimize the adverse effects of fires on SSCs important to safety" are stated to provide a general level of protection which is afforded to all systems, not only where required to prevent a loss of safe-shutdown capability." 10 CFR 50.48(a) states that "each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A of this part."

The term "important to safety" encompasses a broader scope of equipment than safety-related and safe-shutdown equipment. Though there is a focus on the protection of safety-related equipment or safe-shutdown equipment, this does not imply that there is an exclusion of any equipment which protects nonsafety-related equipment. For example, in accordance with 10 CFR 50.48, some portions of suppression systems may be required in plant areas where a fire could result in the release of radioactive materials to the environment, even if no safety-related or safe-shutdown equipment is located in that particular fire area.

In its response dated October 24, 2007, the applicant stated that as identified in RAI 2.3.3.13-3, sprinkler and standpipe systems in the Condenser Area, Turbine Central Area, Turbine Condenser Gallery, Turbine Hydro Control Power Room, North Railroad Bay, Turbine Condenser Mezzanine, Diesel Engine Fire Pump Room, Turbine Pump Area, Turbine Filter Room, Turbine Moisture Separation Area, Radwaste Tank Vent Filter Room, Radwaste Auxiliary Rooms, and Radwaste Controlled Zone Shop are not within the scope of license renewal. The applicant verified that these systems are used for property protection. The applicant further stated that these sprinkler and standpipe systems do not protect safety-related equipment, are not addressed in PPL's response to Appendix A to BTP APSCB 9.5-1, nor are they credited in the 10 CFR Part 50, Appendix R safe-shutdown analysis.

In addition, the applicant stated that after further review, the sprinkler and standpipe systems for the Turbine Building areas, Reactor Feed Pump Turbine (RFP Lube Oil Reservoir), PFP Turbine Room (RFP Turbine Room), Centrifuge & Conditioner (Lube Oil Conditioner Room), Turbine Hydro Seal Oil Unit (Hydrogen Seal Oil Unit), Turbine Lube oil Area (Turbine Lube oil Reservoir), and Turbine Motor Generator Area (Turbine generator bearings) are included in the Fire Protection Review Report for SSES. They also are included in the response to Appendix A to BTP APSCB 9.5-1, because they protect areas containing combustible liquid.

The staff confirmed that the applicant has provided revised boundary drawings LF-M-122-2, -11, -12, -13 and -14.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-3 acceptable because the applicant has explained that the sprinkler and standpipe systems listed below are not required for compliance with fire protection regulations. The staff determines that the following fire water suppression systems are for property protection and for loss prevention:

- Condenser Area
- Turbine Central Area
- Turbine Condenser Gallery
- Turbine Hydro Control Power Room
- North Railroad Bay
- Turbine Condenser Mezzanine
- Diesel Engine Fire Pump Room
- Turbine Pump Area
- Turbine Filter Room
- Turbine Moisture Separation Area
- Radwaste Tank Vent Filter Room
- Radwaste Auxiliary Rooms
- Radwaste Controlled Zone Shop

The staff concludes that sprinkler and standpipe systems are correctly excluded from the scope of license renewal and from being subject to an AMR. In addition, the staff finds that the applicant has committed to include the following sprinkler and standpipe systems within the scope for the license renewal and subject to an AMR:

- Turbine Building areas
- Reactor Feed Pump Turbine (RFP Lube Oil Reservoir)
- PFP Turbine Room (RFP Turbine Room)
- Centrifuge & Conditioner (Lube Oil Conditioner Room)
- Turbine Hydro Seal Oil Unit (Hydrogen Seal Oil Unit)
- Turbine Lube oil Area (Turbine Lube oil Reservoir)
- Turbine Motor Generator Area (Turbine generator bearings)

The staff is adequately assured that the above sprinkler and standpipe systems for fire suppression will be appropriately considered during aging management activities. Therefore, the staff's concern described is RAI 2.3.3.13-3 is resolved.

In RAI 2.3.3.13-4, dated June 22, 2007, the staff stated that SER Section 9.5.1.3 (NUREG-0776, dated April 1981), describes the low-pressure carbon dioxide (CO_2) fire extinguishing systems for electrical equipment rooms, generator purging, concealed floor and ceiling spaces. This SER section also discusses self-contained Halon 1301 fire extinguishing systems for power generation complex modules. The staff noted that the total flooding CO_2 fire extinguishing systems for electrical equipment rooms, generator purging, concealed floor and ceiling spaces and self-contained Halon 1301 fire extinguishing systems for power generation complex modules do not appear in LRA Section 2.3.3.13 as being in the scope of the license renewal and subject to an AMR.

The staff requested that the applicant verify whether the CO_2 fire extinguishing systems for electrical equipment rooms, generator purging, concealed floor and ceiling spaces and Halon 1301 fire extinguishing systems for power generation complex modules 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) and; if excluded, provide justification.

In its response to RAI 2.3.3.13-4, dated July 24, 2007, the applicant stated:

> The CO_2 and Halon fire extinguishing systems 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). "Spray nozzles, CO_2 and Halon" and "Tank, low pressure CO_2 storage tank (0T102)" are explicitly listed in LRA Table 2.3.3-13 and are subject to an AMR. These suppression systems also include piping, tubing, valve bodies, and bolting, which are also listed in LRA Table 2.3.3-13 as subject to an AMR.
>
> As shown on LRA drawing LR-M-122, Sheet 4, "Fire Protection Carbon Dioxide Systems," normally closed valves isolate the generator purging portion of the CO_2 extinguishing system from the storage tank. The storage tank, attached piping, and isolation valves are within the scope of license renewal and subject to an AMR, as described above. The remainder of the generator purging portion of the CO_2 fire extinguishing system is not in the scope of license renewal. The CO_2 fire extinguishing systems for safety-related and safe-shutdown system protection include those in the electrical equipment rooms and floor and ceiling spaces

(concealed) of the control room. In addition, Power Generation Control Complex (PGCC) modules are provided with self-contained Halon 1301 fire extinguishing systems as described in Section 4.9 of the FPRR, Revision 15, and in Section 9.5.1.3 of NUREG-0776, dated April 1981. These systems are self-contained in the individual modules and, as such, are not shown on an LRA drawing.

In evaluating the applicant's response, the staff found that it was incomplete and that review of LRA Section 2.3.3.13 could not be completed. The staff noted the applicant's explanation that the CO_2 and Halon 1301 fire extinguishing systems are within the scope of license renewal, in accordance with 10 CFR 54.4(a) and subject to an AMR, pursuant to 10 CFR 54.21(a)(1). The staff also noted that a part of the generator purging portion of the CO_2 extinguishing system is not within the scope of license renewal. The staff further noted that the Power Generation Control Complex (PGCC) modules are provided with self-contained Halon 1301 fire extinguishing systems.

The applicant indicated in its response to RAI 2.3.3.14-4 that the CO_2 and Halon fire extinguishing system in question is within the scope of license renewal, but a portion of the CO_2 system was not highlighted on LRA boundary drawing LR-M-122, Sheet 4. This resulted in the staff holding a telephone conference with the applicant on October 3, 2007, to discuss information necessary to resolve its concern described in RAI 2.3.3.13-4. During the teleconference, the staff asked the applicant to explain why a portion of the CO_2 system was not highlighted on LRA boundary drawing LR-M-122, Sheet 4. Further, the staff requested that the applicant verify whether the PGCC modules self-contained Halon 1301 fire extinguishing systems 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).

The applicant clarified that a portion of the CO_2 system for the generator purging system is not within the scope of license renewal, because a malfunction of that portion of the system will not prevent the CO_2 fire extinguishing system from accomplishing its 10 CFR Part 50, Appendix R function. The staff determines that the portion of the CO_2 system in question could not affect the actuation of the CO_2 system, and was correctly excluded from the scope of license renewal and is not subject to an AMR. The staff also determines that the applicant has considered the PGCC self-contained Halon 1301 units as active components and; therefore, excluded them from the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.13-4 is resolved.

In RAI 2.3.3.13-5, dated June 22, 2007, the staff noted that the LRA Table 2.3.3-13 excludes several types of fire protection components that appear in the April 1981 SER (NUREG-0776) for SSES, and/or the applicant's Fire Protection Review Report. These components are listed below:

- Hose stations
- Spray nozzles (water, CO2/Halon 1301)
- Dikes for oil spill confinement
- Floor drains and curbs for fire-fighting water
- Filter housing
- Strainer housing

- Heater housing
- Chamber housing
- Actuator housing
- Pipe supports
- Halon storage bottles
- Water storage tanks
- Buried outside diesel fuel storage tanks
- Heat exchanger (bonnet)
- Turbocharger
- Lubricating oil collecting system components (reactor coolant pump)
- Engine intake and exhaust silencers/muffler (diesel driven fire pump)
- Manual smoke removal systems and their associated components (control structure including CSRs)

The staff requested that the applicant verify whether the components listed above should be included in LRA Table 2.3.3.13 and: if excluded, provide justification.

In its response to RAI 2.3.3.13-5, dated July 24, 2007, the applicant stated in part:

> Fire protection system components that provide safety-related and safe-shutdown system protection (i.e., that are required for compliance with 10 CFR 50.48) are in the scope of license renewal and subject to an AMR unless justification is provided otherwise.
>
> With certain exceptions, the components listed above do not need to be included in LRA Table 2.3.3-13 in that they are already included in the table (as clarified below), included in a separate LRA table excluded from the scope of license renewal or not subject to an AMR. Each type of component listed above is addressed in the following table. The corresponding LRA location is identified for components subject to an AMR and justification is provided, as applicable.

The applicant provided a table as part of its response that identified:

> …certain components of the Fire Protection System were incorrectly omitted from Section 2.3.3.13 and subsequent portions of the LRA. These components are attached to and support the function of the diesel engine driven fire pump (0P511), shown on LRA drawing LR-M-122, Sheet 1. For the most part, these supporting components are not shown on the boundary drawing. An evaluation was performed to determine the extent of this condition…

Based on this evaluation, the applicant identified additional components as being subject to an AMR. In addition, the applicant amended the applicable boundary drawings and the LRA to include the applicable components.

In evaluating the applicant's response to RAI 2.3.3.13-5, the staff found that it was incomplete and review of LRA Section 2.3.3.13 could not be completed. The staff noted that although the applicant states that it considered some components to be included in other line items, the descriptions of the line items in the LRA do not specifically list all the components. Further, the applicant has committed to interpret some components (*e.g.*, hose stations, curbs for fire fighting water, and pipe supports), as included in "Bulk Commodity" in LRA Table 2.4-10.

The applicant included the following items within the scope of license renewal and subject to an AMR, because of their intended functions as part of the pressure boundary:

- filter bodies
- heater housing
- muffler
- heat exchanger (oil cooler) shell and end cover
- heat exchanger (oil cooler) tubes
- pump casing (diesel fuel oil)
- pump casing (diesel lubricating oil)
- pump casing (diesel cooling water)
- tank (oil pan)
- turbocharger casing

The applicant explained that only components with an intended function other than "pressure boundary" are listed separately from the line item. Because the applicant has committed to interpret these components as included in the line item and the intended function is as a pressure boundary only, the staff is adequately assured that these components will be appropriately considered during plant aging management activities.

The staff found that the actuator housing and turbocharger were not included in the line item descriptions in the LRA. The staff confirms the applicant's interpretation of these components as active, which necessarily will result in more vigorous oversight of the condition and performance of the components. However, the staff disagreed with the applicant that the spray nozzles for fire hoses are considered to be integral to the fire hose, and the applicant's evaluation that fire hose nozzles are not subject to an AMR. The staff determines that the fire hose nozzle function is not pressure tested like hoses and; therefore, should be considered as a passive component and subject to an AMR, in accordance with 10 CFR 54.21(a)(1). The staff noted that LRA Table 2.3.3-13 identified nozzles as within the scope of license renewal and subject to an AMR. Based on its review, the staff is adequately assured that the applicant will appropriately consider fire hose nozzles during plant aging management activities.

The applicant stated that the auxiliary boilers for SSES are electric and do not have fuel oil tanks and; therefore, do not require dikes. The staff believes that the turbine lube oil reservoir room, hydraulic control power room, and lube oil centrifuge and conditioner room may contain dikes for oil spill confinement and requested that the applicant verify whether the dikes for oil spill confinement are above areas that are in-scope, in accordance with 10 CFR 54.4(a) and subject to an AMR, pursuant to 10 CFR 54.21(a)(1).

During the conference call on October 3, 2007 and by letter dated October 24, 2007, the applicant stated that the LRA does not distinguish dikes for oil spill containment from flood curbs. Flood curbs are within the scope of license renewal and subject to an AMR, addressed as a bulk commodity, and listed in LRA Table 2.4-10.

Based on its review, the staff finds the applicant's response acceptable. The applicant stated that LRA does not distinguish dikes for oil spill containment from flood curbs. Flood curbs are within the scope of license renewal and subject to an AMR and included as a bulk commodity in LRA Section 2.4.10, Table 2.4-10. Because the applicant has committed to interpret dikes for oil spill containment as included in the "flood curbs" line item, with the intended function only being that of pressure boundary, the staff is adequately assured the dikes for oil spill containment will be appropriately considered during plant aging management activities.

The applicant stated that the Halon cylinders are stamped DOT and are considered consumables that are replaced periodically and; therefore, not subject to an AMR. The staff disagreed with the applicant interpretation of consumables and noted that SRP-LR, Table 2.1-5, listed tanks as passive components. The staff believes that Halon tanks are part of the Halon fire extinguishment system and; therefore, should be within the scope of license renewal, in accordance with 10 CFR 54.4(a) and subject to an AMR, pursuant to 10 CFR 54.21(a)(1).

During the conference call on October 3, 2007 and by letter dated October 24, 2007, the applicant stated that the SSES Halon cylinders are relatively small spheres, approximately 12 inches in diameter. The technical requirements manual TRS 3.7.3.4.1 for Units 1 and 2, directs the applicant to perform periodic weight and pressure verifications of Halon cylinders. These inspections are implemented under plant procedures 9SM-113-014, SM-113-015, SM-213-014, and SM-213-015 and include inspection of the Halon cylinders for any sign of damage and deterioration. These inspection activities collectively fall under the category of condition monitoring and determine whether the Halon cylinders are at the end of their qualified lives. The staff determined that SRP-LR, Table 2.1-3, page 2.1-15 under "consumable," item "(d)," allows for the exclusion of these components from and AMR, due to required condition monitoring activities.

Although in other license renewal reviews, components similar to the Halon cylinders are considered to be passive and, therefore, included in the scope of license renewal and subject to an AMR, the staff confirms the applicant's interpretation of this component as active. On a plant-specific basis, the applicant has excluded Halon cylinders from an AMR, pursuant to 10 CFR 54.21(a)(1)(ii). The staff also confirms that the applicant has routinely monitored Halon cylinders based on performance or condition criteria specified in Technical Requirements Manual (TRS) 3.7.3.4.1 of the TRM, thus, ensuring that the cylinders maintain their intended function.

Because the applicant has interpreted the Halon cylinders as part of an active component (condition monitoring to determine whether the Halon cylinders are at the end of their qualified lives) the staff concludes that the component was correctly excluded from the scope of license renewal and is not subject to an AMR.

Further, the staff requested that the applicant verify whether following line items listed in the above table are in-scope, in accordance with 10 CFR 54.4(a) and subject to an AMR, in accordance with 10 CFR 54.21(a)(1):

- Filter housing
- Strainer housing
- Actuator housing

During the conference call on October 3, 2007 and by letter dated October 24, 2007, the applicant stated that filter and actuator housings are within the scope of license renewal, in accordance with 10 CFR 54.4(a) and subject to an AMR pursuant to 10 CFR 54.21(a)(1). The filter and actuator housings are listed in LRA Table 2.3.3-13. The strainer has dual intended functions; namely, the strainer housing performs the pressure boundary function and the strainer internals provide the filtration function.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-5 acceptable because the applicant has adequately explained its interpretation of the component characterization. The staff confirms the applicant’s interpretation of this component as active, which necessarily will result in more vigorous oversight of the condition and performance of the component. The staff is adequately assured that these components will be appropriately considered as within the scope of license renewal and subject to an AMR. Therefore, the staff’s concerns described in RAI 2.3.3.13-5 are resolved.

In RAI 2.3.3.13-6, dated June 22, 2007, the staff noted that in LRA Section 2.3.3.13, the applicant discussed requirements for the fire water supply system, but does not mention trash racks and traveling screens for the fire pump suction water supply. Trash racks and traveling screens are located upstream of the fire pump suctions to remove any major debris from the fresh or raw water. Trash racks and traveling screens are necessary to remove debris from and prevent clogging of the fire protection water supply system. Trash racks and traveling screens are typically considered as passive and long-lived components. Both trash racks and traveling screens are located in a fresh or raw water and/or air environment and are typically constructed of carbon steel. Carbon steel located in a fresh or raw water environment or water and/or air environment is subject to loss of material, pitting, crevice formation, microbiologically influenced corrosion, and fouling. The staff requested that the applicant explain the apparent exclusion of the trash racks and traveling screens located upstream of the fire pump suctions from the scope of license renewal, in accordance with 10 CFR 54.4(a) and subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

In its response to RAI 2.3.3.13-6, dated July 24, 2007, the applicant stated:

> As described in LRA Section 2.3.3.13, System Description, Water Supplies, the primary source of fire protection water is the Clarified Water Storage Tank, addressed in LRA Section 2.3.3.21, and the second and third sources are the basins of hyperbolic natural draft cooling towers for Units 1 and 2, addressed in LRA Section 2.3.3.6. Accordingly, the fire pumps at SSES are horizontal, centrifugal type pumps as described in FPRR Section 4.1, rather than vertical wet pit pumps, and do not take

suction from an open bay. Since the pumps do not take suction from a natural source or bay, trash racks and traveling screens are neither required nor installed at SSES.

Boundary drawings LR-M-115, Sheet 1 and LR-M-2115, Sheet 1, which are identified in LRA Section 2.3.3.6, show the outlet screens for the cooling tower basin in the scope of license renewal (highlighted green). As described in LRA Section 2.4.9.6, LRA Table 2.4-9, and LRA Table 3.5.2-9, the Cooling Tower Basin Outlet Screens are in license renewal scope and are subject to an AMR as structural commodities. They are constructed of stainless steel and are fixed screens.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.3-6 acceptable because the applicant adequately described that the intended function supporting the fire pump suction supply is accomplished from the water storage tank and basins of the hyperbolic natural draft cooling towers for Units 1 and 2. The fire pumps at SSES do not take suction from a natural source or bay, therefore, trash racks and traveling screens are not required. In addition, the staff confirms that the applicant has placed cooling tower basin outlet screens within the scope of license renewal and subject to an AMR, as structural commodities. Therefore, the staff's concern described in RAI 2.3.3.13-6 is resolved.

2.3.3.13.3 Conclusion

The staff reviewed the LRA, UFSAR, LRA boundary drawings (original and revised), and RAI responses to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the fire protection system and components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the fire protection mechanical components subject an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.14 Fuel Pool Cooling and Cleanup System and Fuel Pools and Auxiliaries

2.3.3.14.1 Summary of Technical Information in the Application

LRA Section 2.3.3.14 describes the fuel pool cooling and cleanup system (FPCCS) system and fuel pools and auxiliaries that cool the fuel storage pool water by transferring decay heat of the irradiated fuel through heat exchangers to the SWS. The FPCCS and fuel pools and auxiliaries contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the SSCs in the FPCCS and fuel pools and auxiliaries could prevent satisfactory performance of a safety-related function. LRA Table 2.3.3-14 identifies FPCCS and fuel pools and auxiliaries component types within the scope of license renewal and subject to an AMR.

2.3.3.14.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14, UFSAR Sections 9.1.3 and 9.1.2, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review of LRA Section 2.3.3.14 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. In addition to RAIs 2.3.3.14-1, 2.3.3.14-2, and 2.3.3.14-11 related to boundary drawing continuation errors described in LRA Section 2.3.3, the applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.14-3, dated August 27, 2007, the staff noted that boundary drawing LR-M-154-1, locations C3, C6, and C9, show the boundary (pursuant to 10 CFR 54.4(a)(2)) at the top of the fuel pool filter demineralizers. Though not within the scope of license renewal, two-inch vent pipes are shown exiting the top of the filter demineralizers and going to the vent header two-inch HBD-87 piping, which also is not within scope of licensing renewal. Boundary drawing LR-M-154-1, location A1, shows a continuation from the out-of-scope vent header two-inch HBD-87 piping to boundary drawing LR-M-166-2, location A2, where the two-inch HBD-87 piping is shown within the scope of license renewal. The staff requested that the applicant explain why the two-inch vent piping and two-inch HBD-87 vent header piping are not within the scope of license renewal.

In its response to RAI 2.3.3.14-3, dated October 18, 2007, the applicant stated in part:

> License renewal Note E on drawing LR-M-166-2 states that component vents routed to a tank are considered to potentially contain liquid and are included in the evaluation boundaries.
>
> The vent piping from the fuel pool filter demineralizers on drawing LR-M-154-1 up to the vent header and continuing onto drawing LR-M-166-2 at location A2 and to the connection to the fuel pool backwash receiving tank is within the scope of license renewal per the criteria of 10 CFR 54.4(a)(2). The drawings were revised to highlight the piping [as 10 CFR 54.4(a)(2)].

Because the components being added are addressed under the "piping and piping components" line item in LRA Table 2.3.3-14, the applicant stated that no changes are required to this table.

The applicant further stated that the LRA:

> …was amended to address the materials for the components added to the scope of license renewal per this response. The internal environment for the carbon and stainless steel vent piping is evaluated as a ventilation environment. In addition it was noted that there is carbon steel piping subject to the treated water environment. Evaluation of that piping was also added to LRA Table 3.3.2-14.

The staff confirms that the applicant has submitted revised boundary drawings LR-M-154-1 and LR-M-166-2, and has revised LRA Table 3.3.2-14.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-3 acceptable because the applicant has clarified that the piping in question is within the scope of license renewal and has made appropriate revisions to boundary drawings LR-M-154-1 and LR-M-166-2 and LRA Table 3.3.2-14. Therefore, the staff's concern described in RAI 2.3.3.14-3 is resolved.

In RAI 2.3.3.14-4, dated August 27, 2007, the staff noted that boundary drawing LR-M-153-2, location F4, shows the continuation of one-inch HBD piping to boundary drawing LR-M-161-1, location E1, which is within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). Boundary drawing LR-M-153-2 did not provide the complete pipe identification number. Review of the continuation boundary drawing LR-M-161-1, location E1, did not show the one-inch HBD piping specifically identified or show the continuation of the in-scope piping from boundary drawing LR-M-153-2. The staff requested that the applicant provide additional information to include the complete one-inch HBD pipe identification number on boundary drawings LR-M-153-2 and LR-M-161-1 and explain why the continuation of the in-scope boundary from boundary drawing LR-M-153-2 is not shown as within the scope of license renewal on boundary drawing LR-M-161-1.

In its response, dated October 18, 2007, the applicant stated:

> The continuation of the one-inch HBD drain line from the refueling bellows area of the primary containment on drawing LR-M-153-2 is included in the listing of sources draining to the drywell equipment drain tank on drawing LR-M-161-1, location E1. The line from LR-M-153-2, location F4, is addressed by the listing "Bellows Drain (M-153)."
>
> The subject 1-inch drain line on LR-M-153-2 that continues to LR-M-161-1 should not be highlighted as within the scope of license renewal for 10 CFR 54.4(a)(2) because it is located inside containment where the equipment is designed to get wet. Drawing LR-M-153-2 was revised to reflect this change.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-153-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-4 acceptable because the applicant has clarified that the piping in question on boundary drawing LR-M-1-153-2 is not within the scope of license renewal and has made appropriate revisions to boundary drawing LR-M-153-2. Therefore, the staff's concern described in RAI 2.3.3.14-4 is resolved.

In RAI 2.3.3.14-5, dated August 27, 2007, the staff noted that boundary drawings LR-M-153-2, location F5, shows the continuation of two-inch HBD-1052 piping to boundary drawing LR-M-161-1, location E1, which is within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). Review of the continuation boundary drawing LR-M-161-1, location E1, did not show the two-inch HBD-1052 piping specifically identified or show the continuation of the in-scope piping from boundary drawing LR-M-153-2. The staff requested that the applicant provide additional information that indicates where the two-inch HBD-1052 pipe continuation is located on boundary drawing LR-M-161-1 and explain why the continuation of the in-scope boundary from boundary drawing LR-M-153-2 is not shown as within the scope of license renewal on boundary drawing LR-M-161-1.

In its response to RAI 2.3.3.14-5, dated October 18, 2007, the applicant stated:

> The continuation of the 2” HBD-1052 drain line from the refueling bellows area of the primary containment on drawing LR-M-153-2 is included in the listing of sources draining to the drywell equipment drain tank on drawing LR-M-161-1 at location E1. The line from LR-M-153-2 at location F5 is addressed by the listing “Bellows Drain (M-153)”.
>
> The subject two-inch drain line on LR-M-153-2 that continues to LR-M-161-1 should not be highlighted as within the scope of license renewal for 10 CFR 54.4(a)(2) because it is located inside containment where the equipment is designed to get wet.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-153-2.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.14-5 acceptable because the applicant has clarified that the piping in question on boundary drawing LR-M-1-153-2 is not within the scope of license renewal and has made appropriate revisions to boundary drawing LR-M-153-2. Therefore, the staff’s concern described in RAI 2.3.3.14-5 is resolved.

In RAI 2.3.3.14-6, dated August 27, 2007, the staff noted that boundary drawing LR-M-2153-2, location F4, shows the continuation of one-inch HBD piping to boundary drawing LR-M-2161-1, location F1, which is within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). The LR-M-2153-2 boundary drawing did not provide the complete pipe identification number. Review of the continuation boundary drawing LR-M-2161-1, location F1, did not show the one-inch HBD piping specifically identified or show the continuation of the in-scope piping from boundary drawing LR-M-2153-2. The staff requested that the applicant provide additional information that includes the complete one-inch HBD pipe identification number on boundary drawings LR-M-2153-2 and LR-M-2161 and explain why the continuation of the in-scope boundary from boundary drawing LR-M-2153-2 is not shown as within the scope of license renewal on boundary drawing LR-M-2161.

In its response to RAI 2.3.3.14-6, dated October 18, 2007, the applicant stated in part:

> The continuation of the one-inch HBD drain line from the refueling bellows area of the primary containment on drawing LR-M-2153-2 is included in the listing of sources draining to the drywell equipment drain tank on drawing LR-M-2161-1, location F1. The line from LR-M-2153-2 at location F4 is addressed by the listing “Bellows Leakage Drain (M-2153).”
>
> The subject one-inch drain line on LR-M-2153-2 that continues to LR-M-2161-1 should not be highlighted as within the scope of license renewal for 10 CFR 54.4(a)(2) because it is located inside containment where the equipment is designed to get wet. Refer to LRA Section 2.1.1.2.2 and the enclosed response to RAI 2.3.3.23-3 for an

explanation.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-2153-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-6 acceptable because the applicant has clarified that the piping in question on boundary drawing LR-M-1-2153-2 is not within the scope of license renewal and has made appropriate revisions to boundary drawing LR-M-2153-2. Therefore, the staff's concern described in RAI 2.3.3.14-6 is resolved.

In RAI 2.3.3.14-7, dated August 27, 2007, the staff noted that boundary drawing LR-M-2153-2, location F5, shows the continuation of two-inch HBD-2052 piping to boundary drawing LR-M-2161-1, location F1, which is within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). Review of the continuation boundary drawing LR-M-2161-1, location F1, did not show the two-inch HBD-2052 piping specifically identified or show the continuation of the in-scope piping from boundary drawing LR-M-2153-2. The staff requested that the applicant provide additional information that indicates where the two-inch HBD-2052 piping continuation is located on boundary drawing LR-M-2161-1 and explain why the continuation of the in-scope boundary from boundary drawing LR-M-2153-2 is not shown as within the scope of license renewal on boundary drawing LR-M-2161-1.

In its response to RAI 2.3.3.14-7, dated October 18, 2007, the applicant stated in part:

> The continuation of the 2 inch HBD-2052 drain line from the refueling bellows area of the primary containment on drawing LR-M-2153-2 is included in the listing of sources draining to the drywell equipment drain tank on drawing LR-M-2161-1 at location F1. The line from LR-M-2153-2 at location F5 is addressed by the listing "Bellows Leakage Drain (M-2153)".
>
> The subject 2 inch drain line on LR-M-2153-2 that continues to LR-M-2161-1 should not be highlighted [as 10 CFR 54(a)2)]. This drain line is located inside primary containment where the equipment is designed to get wet. Refer to LRA Section 2.1.1.2.2 and the enclosed response to RAI 2.3.3.23-3 for an explanation.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-2153-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-7 acceptable because the applicant has clarified that the piping in question on boundary drawing LR-M-1-2153-2 is not within the scope of license renewal and has made appropriate revisions to boundary drawing LR-M-2153-2. Therefore, the staff's concern described in RAI 2.3.3.14-7 is resolved.

In RAI 2.3.3.14-8, dated August 27, 2007, the staff noted that boundary drawing LR-M-153-2 shows six weirs with screens at locations D1, D2, D3, D5, and D6 at the ends of four-inch HCD-143 piping; diffusers at locations E2 and E6 at the ends of six-inch HCD-158 piping, and location E9 at the end of six-inch HCD-3023 piping; and a grate at location F9 at the start of six-inch HCD-3024 piping that are within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). Boundary drawing LR-M-2153-2 shows six weirs with screens at locations

D1, D2, D3, D5, and D6 at the ends of four-inch HCD-243 piping; diffusers at locations E2 and E6 at the ends of six-inch HCD-258 piping; and grates at location E3 at the start of three-inch HBC-220 piping that are within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). None of these component types are listed in LRA Table 2.3.3-14 for components subject to an AMR. The staff requested that the applicant explain why these component types are not included in LRA Table 2.3.3-14.

In its response to RAI 2.3.3.14-8, dated October 18, 2007, the applicant stated in part:

> The weirs (with screens) and diffusers on drawing LR-M-153-2 all perform a structural integrity function. As such, they are evaluated as component type "piping and piping components", which is included with a structural integrity function in LRA Table 2.3.3-14. The grate at location F9 is embedded in the floor of the shipping cask storage pit does not have the potential for affecting safety-related components through spatial interaction and therefore does not meet the criteria of 10 CFR 54.4(a)(2). Drawing LR-M-153-2 has been revised to indicate that the grate at location F9 is not within the scope of license renewal.
>
> The weirs (with screens) and diffusers on drawing LR-M-2153-2 all perform a structural integrity function. As such, they are evaluated as component type "piping and piping components", which is included with a structural integrity function in LRA Table 2.3.3-14.
>
> The piping within the primary containment, including the grates at location E3, was removed from the scope of license renewal on drawing LR-M-2153-2. Refer to LRA Section 2.1.1.2.2 and the enclosed response to RAI 2.3.3.23-3 for the explanation.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-153-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-8 acceptable because the applicant has explained that the components in question are included as a component type within "piping and piping components" in LRA Table 2.3.3-14 and that boundary drawing LR-M-153-2 was revised because the grate at location F9 is not in-scope. Therefore, the staff's concern described in RAI 2.3.3.14-8 is resolved.

In RAI 2.3.3.14-9, dated August 27, 2007, the staff noted that boundary drawing LR-M-153-2 shows grates at locations E1, E3, E5, E6, E7, E8, E9, and F9, with only the F9 grate at the start of 6" HCD-3024 piping shown within the scope of licensing renewal. Boundary drawing LR-M-2153-2 shows grates at locations E1, E3, E5, E6, E7, and E8, with only two of the E3 grates at the start of three-inch HBC-120 piping shown within the scope of license renewal. All of the grates are shown located at the entrance to the drain piping within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). The staff requested that the applicant explain why some grates are within the scope of license renewal and some are not, when they all flow into piping that is within the scope of licensing renewal.

In its response to RAI 2.3.3.14-9, dated October 18, 2007, the applicant stated in part:

> Based on the response to RAI 2.3.3.14-8, drawing LR-M-153-2 has been revised to indicate the grate at location F9 at the start of six-inch HCD-3024 piping as not within the scope of license renewal. This change was based on the grate being embedded in the floor of the shipping cask storage pit; therefore, not having the potential for affecting safety-related components through spatial interaction and not meeting the criteria of 10 CFR 54.4(a)(2).
>
> The piping within the primary containment, including the grates at location E3, was removed from the scope of license renewal on drawing LR-M-2153-2. Refer to LRA Section 2.1.1.2.2 and the enclosed response to RAI 2.3.3.23-3 for the explanation. Note that revised boundary drawing LR-M-2153-2 was prepared in response to RAI 2.3.3.14-11.
>
> All of the grates are embedded in concrete and therefore do not have the potential for affecting safety-related components through spatial interaction. Therefore, the grates do not meet the criteria of 10 CFR 54.4(a)(2) and are not within the scope of license renewal.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-2153-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-9 acceptable because the applicant has explained that all the grate components in question are not within the scope of license renewal, since they are embedded in concrete and that boundary drawing LR-M-2153-2 was revised to indicate that none of the grates are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.14-9 is resolved.

In RAI 2.3.3.14-10, dated August 27, 2007, the staff noted that boundary drawing LR-M-153-2, location E3, shows two grates, which are identified as not within the scope of license renewal, that drain into three-inch HBC-120 piping that is within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). Boundary drawing LR-M-2153-2, also at location E3, shows essentially the same two grates, which are identified as within the scope of licensing renewal, that drain into three-inch HBC-220 piping within the scope of licensing renewal, pursuant to 10 CFR 54.4(a)(2) and also draining to the liquid radwaste system. The staff requested that the applicant explain why there is a difference of grate scope classification between Unit 1 and Unit 2, when the grates essentially have the same location, piping size, function, and destination.

In its response to RAI 2.3.3.14-10, dated October 18, 2007, the applicant stated in part:

> The piping within the primary containment, including the grates at location E3 on drawing LR-M-2153-2, was removed from the scope of license renewal. This change to drawing LR-M-2153-2 was identified as Revision 1. The basis for the removal of the piping within primary containment on drawings LR-M-153-2 and LR-M-2153-2 from the scope of license renewal was that safety-related components inside containment are designed for a harsh environment, including spray, and are not plausible targets for spatial interaction. The subject components are not connected to safety-related piping. Refer to LRA Section 2.1.1.2.2 and the enclosed response to RAI 2.3.3.23-3 for the explanation.

The staff confirms that the applicant has submitted revised boundary drawings LR-M-153-2 and LR-M-2153-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-10 acceptable because the applicant has explained that all piping and grate components in question were removed from the scope of license renewal, and that boundary drawings LR-M-2153-1 and LR-M-2153-2 were appropriately revised. Therefore, the staff's concern described in RAI 2.3.3.14-10 is resolved.

In RAI 2.3.3.14-12, dated August 27, 2007, the staff noted that boundary drawing LR-M-2153-1, location F6, shows orifice FE 25234 highlighted in green, indicating that it is within the scope of license renewal, pursuant to 10 CFR 54.4(a)(1). Boundary drawing LR-M-153-1, location F6, orifice FE 15324 is highlighted in pink, indicating that it is within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). The staff requested that the applicant explain why different scoping criterion was used for the Unit 1 versus Unit 2 orifices.

In its response to RAI 2.3.3.14-12, dated October 18, 2007, the applicant stated in part that:

> Orifice FE 15324, like FE 25324, is a Q-Class component (i.e., safety-related) and therefore meets the scoping criteria of 10 CFR 54.4(a)(1). The highlighting error on LR-M-153-1 was revised to include orifice FE15324 as within the scope of license renewal for criteria 10 CFR 54.4(a)(1).

The staff confirms that the applicant has submitted revised boundary drawing LR-M-153-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-12 acceptable because the applicant has clarified that the orifices in question are both within the scope of license renewal, pursuant to 10 CFR 54.4(a)(1) and has revised boundary drawing LR-M-153-1. Therefore, the staff's concern described in RAI 2.3.3.14-12 is resolved.

In RAI 2.3.3.14-13, dated August 27, 2007, the staff noted that boundary drawings LR-M-153-1, location C6 and boundary drawing LR-M-2153, location C3, show 10-inch HBC-114/214 within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2), as nonsafety-related for spatial interaction. The piping numbering system of boundary drawing LR-M-100 indicates that these piping components are American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Class 3. ASME Code, Section III, Class 3 components typically are safety-related and fall within the scope of license renewal, pursuant to 10 CFR 54.4(a)(1). The staff also noted other similar occurrences on these boundary drawings. The staff requested that the applicant explain why portions of ASME Code, Section III, Class 3 components on boundary drawings LR-M-153/2153-1 are not safety-related and why they are not within the scope of license renewal, pursuant to 10 CFR 54.4(a)(1).

In its response to RAI 2.3.3.14-13, dated October 18, 2007, the applicant stated:

> The FSAR Table 3.2-1 under the Fuel Pool Cooling and Cleanup System, shows that the principal construction code for the piping downstream of valve 1(2)53001 (10" HBC-114/214) is ASME Section III, Class 3. The same table shows that this piping is not within the scope of 10 CFR 50, Appendix B. Hence, the pipe is ASME III, Class 3, but is not safety-related. Reference LR-M-100-2 at E3, PPL's drawing convention is

to “cross-hatch” pipelines that are safety-related. The lack of “cross-hatching” indicates that HBC-114/214, as well as other similar instances of ASME Section III pipes, are not safety-related.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.14-13 acceptable because the applicant has verified that UFSAR Table 3.2-1 shows that this piping is not within the scope of 10 CFR Part 50, Appendix B and is not safety-related. Therefore, the staff’s concern described in RAI 2.3.3.14-13 is resolved.

2.3.3.14.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff’s review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the fuel pool cooling and cleanup system and fuel pools and auxiliaries mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the FPCCS and fuel pools and auxiliaries mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.15 Neutron Monitoring System

2.3.3.15.1 Summary of Technical Information in the Application

LRA Section 2.3.3.15 describes the neutron monitoring system (NMS). The NMS contains safety-related components relied upon to remain functional during and following DBEs. In addition, the NMS performs functions that support ATWS and EQ. LRA Table 2.3.3-15 identifies NMS component types within the scope of license renewal and subject to an AMR.

2.3.3.15.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the NMS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.16 Nitrogen and Hydrogen System

2.3.3.16.1 Summary of Technical Information in the Application

LRA Section 2.3.3.16 describes the nitrogen and hydrogen system, which provides gaseous nitrogen for containment makeup and hydrogen for cooling the main generator during normal plant operation. The failure of nonsafety-related SSCs in the nitrogen and hydrogen system potentially could prevent the satisfactory accomplishment of a safety-related function. Although connected to safety-related components for makeup and purge of the nitrogen in containment, no nitrogen and hydrogen system mechanical components are subject to an AMR.

2.3.3.16.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the nitrogen and hydrogen system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.17 Primary Containment Atmosphere Circulation System

2.3.3.17.1 Summary of Technical Information in the Application

LRA Section 2.3.3.17 describes the primary containment atmosphere circulation system. The primary containment atmosphere circulation system contains safety-related components relied upon to remain functional during and following DBEs. In addition, the primary containment atmosphere circulation system performs functions that support EQ. LRA Table 2.3.3-16 identifies primary containment atmosphere circulation system component types within the scope of license renewal and subject to an AMR.

2.3.3.17.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the primary containment atmosphere circulation system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.18 Process and Area Radiation Monitoring System

2.3.3.18.1 Summary of Technical Information in the Application

LRA Section 2.3.3.18 describes the process and area radiation monitoring system, which monitors releases of radioactive material in the plant gaseous and liquid process and effluent streams to detect, alarm, indicate, and generate appropriate automatic actions to control releases exceeding predetermined limits. The process and area radiation monitoring system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the process and area radiation monitoring system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the process and area radiation monitoring system performs functions that support EQ. LRA Table 2.3.3-17 identifies process and area radiation monitoring system component types within the scope of license renewal and subject to an AMR.

2.3.3.18.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.18, UFSAR Sections 7.6 and 11.5, and the license renewal boundary drawings using the methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In a phone call with the applicant on November 19, 2008, the staff requested clarification of information contained in the license renewal boundary drawings. LRA Section 2.3.3.18 lists the license renewal boundary drawings that depict components of the process and area radiation monitoring system (RMS). During its review of drawing LR-M-178, Sheet 1, the staff was unable to discern the components that were part of the process and area RMS. The applicant was able to identify components AN07801 and FE07801, in this drawing, as the parts of the process and area RMS and in-scope for their pressure boundary function, only.

In RAI 2.3.3.18-1, dated December 3, 2008, the staff noted that the process and area RMS was composed of a number of subsystems identified in the UFSAR for SSES. These subsystems include both safety-related and nonsafety-related systems. The LRA did not specifically address the scoping and screening results for each of the subsystems listed in the UFSAR. The staff requested that the applicant clarify the scoping and screening of each subsystem and provide drawing locations for subsystem components, if applicable.

In its response to RAI 2.3.3.18-1, dated December 12, 2008, the applicant stated that the following subsystems were within the scope of license renewal:

- Standby Gas Treatment Vent Duct Exhaust RMS
- Standby Gas Treatment Vent Stack Exhaust Monitor and Sample RMS
- Refueling Floor Wall Duct Exhaust RMS
- Refueling Floor High Exhaust Duct RMS
- Railroad Access Exhaust Duct RMS
- Outside Air Intake Duct (Influent) RMS
- Service Water Discharge/Supplemental Decay Heat Removal RMS
- Main Steamline RMS
- RHR Service Water RMS
- Reactor Building Closed Cooling Water RMS
- Primary Containment Atmospheric Monitoring
- Primary Containment RMS (High Range)

The staff confirms that the applicant's response also provided the screening results for the in-scope components of each of these systems.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.18-1 acceptable because the applicant has clarified with sufficient detail, its scoping and screening review of the subsystems that make up the process and area RMS. Therefore, the staff's concern described in RAI 2.3.3.18-1 is resolved.

2.3.3.18.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and boundary drawings to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the process and area RMS components within scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the process and area RMS components subject to an AMR review, in accordance with the requirements of

10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.19 Radwaste Liquid System

2.3.3.19.1 Summary of Technical Information in the Application

LRA Section 2.3.3.19 describes the radwaste liquid system, which collects, processes, stores, and monitors, for reuse and disposal, the radioactive liquid wastes generated by plant operation. The radwaste liquid system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the radwaste liquid system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the radwaste liquid system performs functions that support EQ. LRA Table 2.3.3-18 identifies radwaste liquid system component types within the scope of license renewal and subject to an AMR.

2.3.3.19.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.19, UFSAR Section 11.2, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.19-1, dated August 27, 2007, the staff noted that boundary drawings LR-M-161-2 and LR-M-2161-2, locations C1 to E1, provide a list of items (components, drains, vents, etc.) that are contained in a non-boundary continuation box that interfaces directly with two four-inch XBD pipelines within the scope of license renewal. The list does not show details about the boundary drawing, sheet, and location numbers for the listed items in order to review and evaluate the license renewal scope boundaries. The staff requested that the applicant identify these license renewal boundaries.

In its response to RAI 2.3.3.19-1, dated October 18, 2007, the applicant stated:

> The boxes on LR-M-161-2 and LR-M-2161-2 do not represent specific components and are not highlighted. The boxes represent that numerous drain lines from the listed systems and drawings are coming together into the lines continued from the box. Most of the piping making up the drain lines coming into the "box" is embedded in the building's floor and wall concrete. As the concrete forms a tight seal around the embedded drain line, spatial interaction is not reasonable for embedded piping. Therefore, the embedded portions of the drain lines coming into the box are not subject to AMR. The portions of these drain lines not embedded in concrete are within the scope of license renewal, are subject to AMR and are included in LRA Section 2.3.3.19 and Table 2.3.3.18, as "Piping and Piping Components" with the intended function of "Structural Integrity." The piping from the box is addressed on LR-M-161-2 and LR-M-2161-2, the liquid radwaste drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-1 acceptable because the applicant has adequately explained how the boxes on boundary drawings

LR-M-161-2 and LR-M-2161-2 do not represent components and why they are not in-scope. The applicant further clarified that portions of pipelines are in concrete to prevent spatial interaction and; therefore, are not subject to an AMR, while those pipe sections not embedded in concrete are subject to AMR and are included in LRA Section 2.3.3.19 and Table 2.3.3.18. Therefore, the staff's concern described in RAI 2.3.3.19-1 is resolved.

In RAI 2.3.3.19-2, dated August 27, 2007, the staff noted that boundary drawings LR-M-161-1 and LR-M-2161-1, locations E5 and F5, and boundary drawings LR-M-161-2 and LR-M-2161-2, locations A4, B4, C4, D4, E4, E5, E3, F3, G3, and H3, show drum traps (*e.g.*, P-25-6, P-29-6, etc.) within the scope of license renewal. However, the drum trap is not included in LRA Table 2.3.3-19 as a component subject to an AMR. The staff requested that the applicant explain why the drum traps are not included in LRA Table 2.3.3-19.

In its response to RAI 2.3.3.19-2, dated October 18, 2007, the applicant stated:

> As stated in LRA Section 2.1.2.1.3, screening of mechanical components for nonsafety affecting safety (NSAS) considerations was performed on a commodity group basis. The commodity group of "piping and piping components" includes all in-line piping components except for major equipment such as tanks and heat exchangers.
>
> The components identified on the Radwaste Liquid System drawings as drum traps are evaluated as the component type of "cleanout" and are included in the Table 2.3.3-19 line item "Piping and piping components – cleanouts and pump casings (1/2P225A/B)".

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-2 acceptable because the applicant has verified that PPL evaluates drum traps as a line item in the commodity group of "piping and piping components – cleanouts and pump casings" that is included in LRA Table 2.3.3-19. Therefore, the staff's concern described in RAI 2.3.3.19-2 is resolved.

In RAI 2.3.3.19-3, dated August 27, 2007, the staff noted that boundary drawings LR-M-161-1 and LR-M-2161-1, location H8 show a cooling coil in the RB sump that is connected to two-inch JBD-139 and two-inch JBD-140 piping that is shown within the scope of license renewal. However, the cooling coil is not included within the scope of license renewal. The staff requested that the applicant explain why the cooling coil is not within the scope of license renewal.

In its response to RAI 2.3.3.19-3, dated October 18, 2007, the applicant stated:

> The cooling coil does not perform a safety-related function; therefore, is not in-scope for criterion 10 CFR 54.4(a)(1). The cooling coil is completely enclosed within the reactor building sump and, therefore, can not have any spatial interaction with safety-related equipment and the sump itself does not perform a safety-related function. Thereby the cooling coil is not in-scope for criterion 10 CFR 54.4(a)(2). The coil does not support any of the regulated event functions and, therefore, the cooling coil is not in-scope for criterion 10 CFR 54.4(a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-3 acceptable because the applicant has verified that the cooling coil is not within the scope of license renewal for license renewal because: (a) it does not perform a safety-related function, (b) it cannot have any spatial interaction with safety-related equipment, and (c) the coil does not support any of the regulated event functions. Therefore, the staff's concern described in RAI 2.3.3.19-3 is resolved.

In RAI 2.3.3.19-4, dated August 27, 2007, the staff noted that boundary drawing LR-M-2161-2, location B1, shows a continuation from demineralized water distribution on boundary drawing LR-M-118-2, location C2. The staff was unable to find boundary drawing LR-M-118-2 in the LRA-provided boundary drawing package. The only boundary drawing found from demineralized water distribution was LR-M-118-3, which included the correct continuation from location C2 to boundary drawing LR-M-2161-2, location B1. The staff requested that the applicant clarify that boundary drawing LR-M-118-3, rather than boundary drawing LR-M-118-2, was the correct continuation boundary drawing to boundary drawing LR-M-2161-2 at location B1.

In its response to RAI 2.3.3.19-4, dated October 18, 2007, the applicant stated that the continuation from boundary drawing LR-M-2161-2, at location B1 should be to boundary drawing LR-M-118-3 at location C2.

The staff confirms that the applicant has corrected and submitted revised boundary drawing LR-M-2161-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-4 acceptable because the applicant has revised the continuation arrow on boundary drawing LR-M-2161-2 to refer to the correct boundary drawing LR-M-118-3, location C2. Therefore, the staff's concern described in RAI 2.3.3.19-4 is resolved.

In RAI 2.3.3.19-5, dated August 27, 2007, the staff noted that boundary drawings LR-M-161-1 and -2161-1, locations B3 and G3, show nonsafety-related to safety-related piping components at penetrations X72A and X72B. LRA Section 2.1.1.2.2, "Spatial Failures of Nonsafety-Related SSCs," page 2.1-8 states in part: "With respect to nonsafety-related piping that is directly connected to safety-related piping, the seismic Category I design requirements are extended to the first seismic restraint beyond the defined boundaries." The staff requested that the applicant provide additional information showing the location of the seismic restraint for the nonsafety-related three-inch HBD-157/257 connected to the safety-related three-inch HBB-119/219 piping, which is within the license renewal boundary.

In its response to RAI 2.3.3.19-5, dated October 18, 2007, the applicant stated:

> PPL's response to RAI 2.1-3, part b, (Reference 3), identified nonsafety-related (NSR) piping and components, inside primary containment and connected to safety-related (SR) piping and components, that are required to remain intact to ensure the structural integrity of the attached SR piping and components. The 3" HBD-155/255 line connected to SR containment penetration X-72B and the 3" HBD-157/257 line connected to penetration X-72A are not highlighted. The penetrations themselves serve as anchor points, and the HBD lines

inside the drywell are not within the boundaries of the seismic analyses that contain the containment boundary valves.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-5 acceptable because the applicant has verified that containment penetrations serve as anchor points and the HBD lines inside the drywell are not within the boundaries of the seismic analyses. Therefore, the staff's concern described in RAI 2.3.3.19-5 is resolved.

2.3.3.19.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings (originals and revised) to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the radwaste liquid system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the radwaste liquid system mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1), and; therefore, is acceptable.

2.3.3.20 Radwaste Solids Handling System

2.3.3.20.1 Summary of Technical Information in the Application

LRA Section 2.3.3.20 describes the radwaste solids handling system, which controls, collects, handles, processes, packages, and temporarily stores prior to offsite shipping, the wet waste sludge generated by the liquid waste management system, the reactor water cleanup system, fuel pool cleanup system, the condensate cleanup system, and the condensate filtration system. The failure of nonsafety-related SSCs in the radwaste solids handling system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-19 identifies radwaste solids handling system component types within the scope of license renewal and subject to an AMR.

2.3.3.20.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the radwaste solids handling system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.21 Raw Water Treatment System

2.3.3.21.1 Summary of Technical Information in the Application

LRA Section 2.3.3.21 describes the raw water treatment system, which includes a clarified water storage tank that is the primary source of water for the fire protection system. The raw water treatment system performs functions that support fire protection. LRA Table 2.3.3-20 identifies raw water treatment system component types within the scope of license renewal and subject to an AMR.

2.3.3.21.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the raw water treatment system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.22 Reactor Building Chilled Water System

2.3.3.22.1 Summary of Technical Information in the Application

LRA Section 2.3.3.22 describes the RB chilled water system, which supplies chilled water during normal plant operation to coolers in various areas of the reactor building (including the Unit 1 and Unit 2 emergency switchgear and load center rooms) and drywell and to the reactor recirculation pump motor coolers. The RB chilled water system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RB chilled water system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RB chilled water system performs functions that support EQ. LRA Table 2.3.3-21 identifies RB chilled water system component types within the scope of license renewal and subject to an AMR.

2.3.3.22.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.22, UFSAR Section 9.2.12.3, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.3.22-1, dated August 27, 2007, the staff noted boundary drawings LR-M-187-2 and LR-M-2187-2 show several one-inch lines and associated isolation valves as not within the scope of license renewal. These lines are directly connected to the RB chilled water system lines that are within the scope of license renewal. The staff requested that the applicant explain why the sections of pipe and components are not within the scope of license renewal.

In its response to RAI 2.3.3.22-1, dated October 18, 2007, the applicant stated:

PPL's response to RAI 2.1-3, (Reference 3), identified nonsafety-related (NSR) piping and components, inside primary containment and connected to safety-related (SR) piping and components, that are required to remain intact to ensure the structural integrity of the attached SR piping and components. The identified nonsafety-related piping and components are in-scope for license renewal based on the criteria of 10 CFR 54.4(a)(2). The scoping determination for the nonsafety-related piping and components is based upon review of the governing piping design analyses. The in-scope portion of the nonsafety-related piping extends from the nonsafety-related -to-safety-related interface to the analytical boundaries of the piping analysis which contains the SR piping and components.

As part of the response to RAI 2.1-3, boundary drawings LR-M-187-2, Revision 1 and LR-M-2187-2, Revision 1 were included to show the revised evaluation boundaries. The piping and valves that are highlighted in pink (magenta) and identified with a reference to LR NOTE D are in-scope for the 10 CFR 54.4(a)(2) function discussed above.

The nonsafety-related piping and valves identified by this RAI are not included in the piping analyses which include the SR valves HV18792B2/HV28792B2, HV18792B1/HV28792B1, HV18782A2/HV28782A2, HV18782A1/HV28782A1, HV18792A2/HV28792A2, HV18792A1/HV28792A1, HV18782B2/HV28782B2, HV18782B1/HV28782B1. The piping and valves are not included in the analyses because they are small diameter branch lines extending from large diameter headers. In the governing piping analyses, small diameter branch lines, such as vents and drains, may be decoupled from the analysis of the headers. This is an acceptable piping design practice that is employed when it is determined that the small diameter branch lines do not significantly affect the loads and stresses on a large diameter header. Therefore, in all cases, the applicable piping analyses, which are part of the current design basis, support the conclusion that the nonsafety-related piping and valves identified by this RAI are not required to remain intact to ensure the structural integrity of the safety-related valves.

As discussed in LRA Section 2.1.1.2.2, and further discussed in the response to RAI 2.3.3.23-3, nonsafety-related piping inside containment is not required to satisfy the 10 CFR 54.4(a)(2) criteria for spatial considerations since the SR equipment inside containment is designed for all potential spatial interactions. Therefore, the nonsafety-related piping and valves identified by this RAI are not in-scope for any criteria of 10 CFR 54.4(a)(2).

The staff confirms that the applicant has submitted revised boundary drawings LR-M-187-2 and LR-M-2187-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.22-1 acceptable because the applicant has clarified that the nonsafety-related piping sections inside containment and in question are not within the scope of license renewal because they are outside the analytical boundaries of the piping analysis, and that the safety-related equipment inside containment is designed for all potential spatial interactions. Therefore, the staff's concern described in RAI 2.3.3.22-1 is resolved.

2.3.3.22.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and boundary drawings (original and revised) to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the RB chilled water system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the RB chilled water system mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.23 Reactor Building Closed Cooling Water System

2.3.3.23.1 Summary of Technical Information in the Application

LRA Section 2.3.3.23 describes the reactor building closed-cooling water (RBCCW) system, which provides cooling water in the reactor and radwaste buildings to nonsafety-related equipment that could carry radioactive fluids or that requires a clean water supply to minimize long-term corrosion. The RBCCW system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RBCCW system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RBCCW system performs functions that support EQ. LRA Table 2.3.3-22 identifies RBCCW system component types within the scope of license renewal and subject to an AMR.

2.3.3.23.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.23, UFSAR Section 9.2.2, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.23-1, dated August 27, 2007, the staff noted boundary drawings LR-M-113-1 and LR-M-2113-1, locations A&B2, A&B3, and A&B4, show RBCCW supply and return to pump seal heat exchangers within the scope of license renewal; however, the RBCCW supply and return piping to the motor bearing coils are not shown within the scope of license renewal. The staff requested that the applicant explain why the piping upstream and/or downstream, including valves 113012, 213012, 113009, 213009, 113017, and 113020, is not within the scope of license renewal. Additionally, the applicant was asked to explain why the sensing lines and root valves connected to the piping bounded by these isolation valves are not within the scope of license renewal.

In its response to RAI 2.3.3.23-1, dated October 18, 2007, the applicant stated in part:

PPL’s response to RAI 2.1-3, part b, sent to the NRC via PLA-6177 dated April 17, 2007, identified nonsafety-related (NSR) piping and components, inside primary containment and connected to safety-related (SR) piping and components, that are required to remain intact to ensure the structural integrity of the attached SR piping and components. The identified nonsafety-related piping and components are in-scope for license renewal based on the criteria of 10 CFR 54.4(a)(2). The scoping determination for the nonsafety-related piping and components is based upon review of the governing piping design analyses. The in-scope portion of the nonsafety-related piping extends from the nonsafety-related -to-safety-related interface to the analytical boundaries of the piping analysis which contains the safety-related piping and components.

As part of the response to RAI 2.1-3, boundary drawings LR-M-113-1, Revision 1 and LR-M-2113-1, Revision 1 were included to show the revised evaluation boundaries. The piping and valves that are highlighted in pink (magenta) and identified with a reference to “SEE LR NOTE C” are in-scope for the 10 CFR 54.4(a)(2) function discussed above.

The nonsafety-related piping and valves identified by this RAI are not included in the piping analyses which include the safety-related valves HV11345, HV11346, HV21345, and HV21346. The piping and valves are not included in the analyses for one of two possible reasons: 1) the piping and valves are located on the unanalyzed side of a physical pipe support anchor which defines the boundary of the analysis, or 2) the piping and valves are part of small diameter branch lines extending from the 3” HBD-129/229 and 3” HBD-130/230 headers. In the governing piping analyses, the small diameter branch lines, including vents and drains, may be decoupled from the analysis of the headers. This is an acceptable piping design practice that is employed when it is determined that the small diameter branch lines do not significantly affect the loads and stresses on a large diameter header. Therefore, in all cases, the applicable piping analyses, which are part of the current design basis, support the conclusion that the nonsafety-related piping and valves identified by this RAI are not required to remain intact to ensure the structural integrity of the safety-related valves HV11345, HV11346, HV21345, and HV21346.

As discussed in LRA Section 2.1.1.2.2, and further discussed in the response to RAI 2.3.3.23-3, nonsafety-related piping inside containment is not required to satisfy the 10 CFR 54.4(a)(2) criteria for spatial considerations since the safety-related equipment inside containment is designed for all potential spatial interactions. Therefore, the nonsafety-related piping and valves identified by this RAI are not in-scope for any criteria of 10 CFR 54.4(a)(2).

The staff confirms that the applicant has submitted revised boundary drawings LR-M-113-1 and LR-M-2113-1.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.23-1 acceptable because the applicant has clarified that the nonsafety-related piping sections inside containment and in question are not within the scope of license renewal, because they are outside the analytical boundaries of the piping analysis. Therefore, the staff's concern described in RAI 2.3.3.23-1 is resolved.

In RAI 2.3.3.23-2, dated August 27, 2007, the staff noted boundary drawing LR-M-113-1 and LR-M-2113-1 show several one-inch lines and associated isolation valves not within the scope of license renewal. These lines are directly connected to RBCCW main lines that are within the scope of license renewal. The staff requested that the applicant explain why these listed sections of pipe and components are not within the scope of license renewal.

In its response to RAI 2.3.3.23-2, dated October 18, 2007, the applicant stated in part:

> The RBCCW piping discussed in this RAI is shown on boundary drawings LR-M-113-1 and LR-M-2113-1. The reference to drawing LR-M-2143-1 in the first sentence of the RAI is considered to be a typographical error.
>
> PPL's response to RAI 2.1-3, part b, sent to the NRC via PLA-6177 dated April 17, 2007, identified nonsafety-related (NSR) piping and components, inside primary containment and connected to safety-related (SR) piping and components, that are required to remain intact to ensure the structural integrity of the attached safety-related piping and components. The identified nonsafety-related piping and components are in-scope for license renewal based on the criteria of 10 CFR 54.4(a)(2). The scoping determination for the nonsafety-related piping and components is based upon review of the governing piping design analyses. The in-scope portion of the nonsafety-related piping extends from the nonsafety-related -to-safety-related interface to the analytical boundaries of the piping analysis which contains the safety-related piping and components.
>
> As part of the response to RAI 2.1-3, boundary drawings LR-M-113-1, Revision 1 and LR-M-2113-1, Revision 1 were included to show the revised evaluation boundaries. The piping and valves that are highlighted in pink (magenta) and identified with a reference to "SEE LR NOTE C" are in-scope for the 10 CFR 54.4(a)(2) function discussed above.
>
> The nonsafety-related piping and valves identified by this RAI are not included in the piping analyses which include the safety-related valves HV11345, HV11346, HV21345, and HV21346. The piping and valves are not included in the analyses for one of two possible reasons: 1) the piping and valves are located on the unanalyzed side of a physical pipe support anchor which defines the boundary of the analysis, or 2) the piping and valves are part of small diameter branch lines extending from the 3" HBD-129/229 and 3" HBD-130/230 headers. In the governing piping analyses, the small diameter branch lines, including vents and drains, may be decoupled from the analysis of the headers. This is an acceptable piping design practice that is employed when it is determined that the small diameter branch lines do not significantly affect the loads and stresses on a large diameter header. Therefore, in all cases, the applicable piping analyses, which are part of the current design basis, support the

> conclusion that the nonsafety-related piping and valves identified by this RAI are not required to remain intact to ensure the structural integrity of the safety-related valves HV11345, HV11346, HV21345, and HV21346.
>
> As discussed in LRA Section 2.1.1.2.2, and further discussed in the response to RAI 2.3.3.23-3, nonsafety-related piping inside containment is not required to satisfy the 10 CFR 54.4(a)(2) criteria for spatial considerations since the safety-related equipment inside containment is designed for all potential spatial interactions. Therefore, the nonsafety-related piping and valves identified by this RAI are not in-scope for any criteria of 10 CFR 54.4(a)(2).

The staff confirms that the applicant has submitted revised boundary drawings LR-M-113-1 and LR-M-2113-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-2 acceptable because the applicant has clarified that the nonsafety-related piping sections inside containment and in question are not within the scope of license renewal, because they are outside the analytical boundaries of the piping analysis. Therefore, the staff's concern described in RAI 2.3.3.23-2 is resolved.

In RAI 2.3.3.23-3, dated August 27, 2007, the staff noted boundary drawing LR-M-113-1, license renewal note B states, "Safety-Related components inside containment (designed for harsh environment) are not plausible targets for spatial interaction." The staff requested that the applicant provide additional information to support the implausibility of safety-related components within containment being impacted by failure of nonsafety-related systems.

In its response to RAI 2.3.3.23-3, dated October 18, 2007, the applicant stated:

> FSAR Sections 3.6.1.1 and 3.11.1 state that essential systems and equipment required to mitigate the consequences of a design-basis accident, or to affect a safe shutdown of the reactor, are designed to remain functional after exposure to the applicable accident environmental conditions and are qualified for service in harsh environments, including spray and/or steam. As such, the safety-related components in the primary containment are designed to remain functional for conditions that bound any potential leakage, spray, or flooding and the corresponding environmental effects (e.g., elevated temperatures and pressures), and are not reasonable targets for spatial interaction, upon failure of nonsafety-related components in that structure. Also, based on FSAR Sections 3.6.1.2 – 3.6.2, safety-related components inside containment are protected from the effects of pipe whip and/or jet impingement (from a high-energy line failure) by separation, barriers or pipe whip restraints. The portions of high-energy piping that are inside containment are all safety-related and in the scope of license renewal based on 10 CFR 54.4(a)(1) scoping criterion. Therefore, nonsafety-related mechanical components inside the containment do not have a plausible potential for failure to impair or prevent the accomplishment of a safety-related SSC's intended function.

> As such, they do not satisfy 10 CFR 54.4(a)(2), scoping criterion and are not within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-3 acceptable because the applicant has provided additional information to support the note B statement concerning the implausibility of safety-related components within containment being impacted by failure of nonsafety-related systems. Therefore, the staff's concern described in RAI 2.3.3.23-3 is resolved.

In RAI 2.3.3.23-4, dated August 27, 2007, the staff noted boundary drawing LR-M-113-1, location B2, refers to note "C" which states "Highlighted nonsafety-related piping is within analytical boundaries of the seismic analyses for the attached safety-related components." Given the placement of the note and the highlighting approach, it is unclear as to what specific components and/or piping is addressed by note "C." The staff requested that the applicant clarify which specific components and/or piping is within the analytical boundaries of the seismic analyses.

In its response to RAI 2.3.3.23-4, dated October 18, 2007, the applicant stated:

> As discussed in the responses to RAIs 2.3.3.23-1 and 2.3.3.23-2 above, the evaluation boundaries of the nonsafety-related piping and components inside containment are based upon the analytical boundaries of the governing piping design analyses. The in-scope portion of the nonsafety-related piping extends from the nonsafety-related -to-safety-related interface to the analytical boundaries of the piping analysis which contains the safety-related piping and components.
>
> LR Note "C" applies to all of the pink (magenta)-highlighted piping and valves inside the primary containment that are part of the HBD-129 and HBD-130 pipelines. The highlighted piping and valves are required to remain intact to ensure the structural integrity of the attached safety-related piping and components and are, therefore, in-scope for license renewal based on the criteria of 10 CFR 54.4(a)(2).
>
> The note to "SEE LR NOTE C" on drawings LR-M-113-1 and LR-M-2113-1 at location B2 should be closer to the 4" HBD-130 and 4" HBD-230 lines in location B1. This would then be similar to the "SEE LR NOTE C" beside the 4" HBD-129 and 4" HBD-229 lines in location B3 of the drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-4 acceptable because the applicant has clarified which components and/or piping is within the analytical boundaries of the seismic analyses, per note C. Therefore, the staff's concern described in RAI 2.3.3.23-4 is resolved.

In RAI 2.3.3.23-5, dated August 27, 2007, the staff noted boundary drawing LR-M-143-2, locations E7 and E8 show RBCCW three-inch supply to pump seal heat exchangers upstream of a three-inch to two-inch reducer as being within the scope of license renewal. The RBCCW piping and components downstream of the reducer are not within the scope of license renewal. The distinction is unclear between the in-scope piping upstream of the reducer and the out-of-scope piping downstream of the reducer. The staff requested that the applicant explain why the piping downstream of the three to two-inch reducer is not within the scope of license renewal.

In its response, dated October 18, 2007, the applicant stated:

> As discussed in the responses to RAIs 2.3.3.23-1 and 2.3.3.23-2 above, the evaluation boundaries of the nonsafety-related piping and components inside containment are based upon the analytical boundaries of the governing piping design analyses. The in-scope portion of the nonsafety-related piping extends from the nonsafety-related -to-safety-related interface to the analytical boundaries of the piping analysis which contains the safety-related piping and components.
>
> The analytical boundary associated with the piping analysis that includes the safety-related containment boundary valve HV11346 ends at the 3"-to-2" reducer at the end of the run of 3" HBD-129 piping on LR-M-143-2 at location E7. Since the piping downstream of the reducer is not part of the piping analysis that includes valve HV11346, it is not required to remain intact to ensure the structural integrity of the safety-related valve. Therefore, it is not within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-5 acceptable because the applicant has clarified that the nonsafety-related piping sections inside containment and in question are not within the scope of license renewal because they are outside the analytical boundaries of the piping analysis. Therefore, the staff's concern described in RAI 2.3.3.23-5 is resolved.

In RAI 2.3.3.23-6, dated August 27, 2007, the staff noted boundary drawing LR-M-143-2, location E8, shows RBCCW three-inch supply to pump seal heat exchangers upstream of a three-inch to two-inch reducer as being within scope of license renewal. The same section of piping identified in Unit 2 and shown on boundary drawing LR-M-2143-2, is identified as not within the scope of license renewal. The reason for this difference in RBCCW system scope between Unit 1 and Unit 2 is unclear. The staff requested that the applicant explain why boundary locations for these sections of piping are defined differently between Units 1 and 2.

In its response to RAI 2.3.3.23-6, dated October 18, 2007, the applicant stated

> As discussed in the response to RAI 2.3.3.23-5 above, the evaluation boundaries of the nonsafety-related piping and components inside containment are based upon the analytical boundaries of the governing piping design analyses. The in-scope portion of the nonsafety-related piping extends from the nonsafety-related -to-safety-related interface to the analytical boundaries of the piping analysis which contains the safety-related piping and components.
>
> The analytical boundary associated with the Unit 1 piping analysis that includes the safety-related containment boundary valve HV11346 ends at the 3"-to-2" reducer at the end of the run of 3" HBD-129 piping on LR-M-143-2 at location E7. The analytical boundary associated with the Unit 2 piping analysis that includes the safety-related containment boundary valve HV21346 ends at a point just downstream of valve

> 213008 on the 3” HBD-229 piping on LR-M-2113-1 at location B2. Thus, the pink-(magenta) highlighted boundary for the Unit 2 RBCCW line ends at valve 213008, which correctly reflects the analytical boundary as the evaluation boundary for license renewal.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.23-6 acceptable because the applicant has clarified that the nonsafety-related piping sections inside containment and in question are not within the scope of license renewal, because they are outside the analytical boundaries of the piping analysis. Therefore, the staff’s concern described in RAI 2.3.3.23-6 is resolved.

In RAI 2.3.3.23-7, dated August 27, 2007, the staff noted boundary drawing LR-M-143-2, locations E7 and E8 show RBCCW supply to pump seal heat exchangers pipe section three-inch HBD-129 within the scope of license renewal. The RBCCW pump seal heat exchangers return line identified as three-inch HBD-130 is not within scope for license renewal on boundary drawing LR-M-143, but identified as within the scope of license renewal on boundary drawing LR-M-113, locations A2 and A4. It is unclear why three-inch HBD-129, on boundary drawing LR-M-143 is within scope for license renewal, whereas three-inch HBD-130 on boundary drawing LR-M-143 is not within the scope of license renewal. The staff requested that the applicant explain why the return piping from the RBCCW pump seal heat exchangers is not within the scope of license renewal.

In its response to RAI 2.3.3.23-7, dated October 18, 2007, the applicant stated:

> As discussed in the response to RAI 2.3.3.23-5 above, the evaluation boundaries of the nonsafety-related piping and components inside containment are based upon the analytical boundaries of the governing piping design analyses. The in-scope portion of the nonsafety-related piping extends from the nonsafety-related -to-safety-related interface to the analytical boundaries of the piping analysis which contains the safety-related piping and components.
>
> The analytical boundaries associated with the piping analysis that includes the safety-related containment boundary valve HV11345 end just upstream of FE11343A and FE11343B on the 3” HBD-130 piping on LR-M-113-1 at locations A2 and A4. The analytical boundary does not encompass any components shown on LR-M-143-2. Thus, the pink-highlighted boundary ends just upstream of the FE’s on LR-M-113-1 and is not continued to any piping represented on LR-M-143-2. The highlighting provides an accurate representation of all piping and piping components that are within the boundaries of the piping analysis and, therefore, within the scope of license renewal.
>
> Since the 3” HBD-130 piping shown on LR-M-143-2 at location E8 is beyond the analytical boundary of the piping analysis that includes valve HV11345, it is not required to remain intact to ensure the structural integrity of the safety-related valve, and, therefore, it is not within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.23-7 acceptable because the applicant has clarified that the nonsafety-related piping sections inside containment and in question are not within the scope of license renewal, because they are outside the analytical boundaries of the piping analysis. Therefore, the staff's concern described in RAI 2.3.3.23-7 is resolved.

2.3.3.23.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the RBCCW system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the RBCCW system mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1), and; therefore, is acceptable.

2.3.3.24 Reactor Building HVAC System

2.3.3.24.1 Summary of Technical Information in the Application

LRA Section 2.3.3.24 describes the reactor building (RB) HVAC system, which during normal plant operation serves three ventilation zones. In addition to ventilating three separate zones during normal plant operation, the RB HVAC system also serves during DBA conditions, various air cooling systems. The RB HVAC system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RB HVAC system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RB HVAC system performs functions that support fire protection and EQ. LRA Table 2.3.3-23 identifies RB HVAC system component types within the scope of license renewal and subject to an AMR.

2.3.3.24.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the RB HVAC system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.25 Reactor Nonnuclear Instrumentation System

2.3.3.25.1 Summary of Technical Information in the Application

LRA Section 2.3.3.25 describes the reactor non-nuclear instrumentation (NIS) system, which consists of the instrumentation for operation of the nuclear boiler for normal power generation, shutdown and refueling operations, and transient and accident conditions. The reactor non-NIS system contains safety-related components relied upon to remain functional during and following DBEs. In addition, the reactor non-NIS system performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.3-24 identifies reactor non-NIS system component types within the scope of license renewal and subject to an AMR.

2.3.3.25.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.25 and UFSAR Sections 6.2 and 7.0 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, pursuant to 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

In RAI 2.3.3.25-1, dated October 24, 2007, the staff requested that the applicant provide additional information regarding boundary drawing LR-M-123-12, which depicts multiple "insulated couplings or unions." The staff also asked the applicant to clarify how these components are included in LRA Table 2.3.3-24 for components subject to an AMR, as a pressure boundary and; if excluded, provide justification.

In its response to RAI 2.3.3.25-1, dated November 14, 2007, the applicant stated:

> Boundary drawing LR-M-123-12 contains the component type "insulated couplings or unions." The couplings and unions on LR-M-123-12 that are within the scope of license renewal are those that contains fluids and are located in the Reactor Building, therefore having the potential for spatial interaction with safety-related components. These components are nonsafety-related and meet the scoping criteria of 10 CFR 54.4(a)(2).
>
> In accordance with PPL's scoping methodology, those components are included within the evaluation boundary of the Sampling System instead of the Reactor Non-nuclear Instrumentation System. As described in LRA Section 2.1.2.1.3, in-line components that are in-scope for 10 CFR 54.4(a)(2), which would include "insulated couplings or unions," are evaluated on a commodity group basis as piping and piping components. The insulated couplings and unions are included in LRA Section 2.3.3.28, Sampling System, and were identified as subject to aging management review in Table 2.3.3-27 under the component type "Piping and Piping Components." The couplings and unions that are subject to aging management review perform an intended function of

Structural Integrity.

No changes to the LRA or boundary drawings were required per this response.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.25-1 acceptable because the applicant has provided the requested clarification that these components were included in LRA Section 2.3.3.28 and in Table 2.3.3-27, as components subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.25-1 is resolved.

2.3.3.25.3 Conclusion

The staff reviewed the LRA, UFSAR, boundary drawings, and RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the reactor non-NIS components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the reactor non-NIS components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.26 Reactor Water Cleanup System

2.3.3.26.1 Summary of Technical Information in the Application

LRA Section 2.3.3.26 describes the reactor water cleanup (RWCU) system, which continuously purifies the reactor water. The RWCU system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RWCU system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RWCU system performs functions that support fire protection, ATWS, and EQ. LRA Table 2.3.3-25 identifies RWCU system component types within the scope of license renewal and subject to an AMR.

2.3.3.26.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the RWCU system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.27 Residual Heat Removal Service Water *System*

2.3.3.27.1 Summary of Technical Information in the Application

LRA Section 2.3.3.27 describes the RHRSW System, which is a safety-related system that is designed to provide a reliable source of cooling water to support RHR system operation and for post-accident core and containment flooding. The RHRSW system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the RHRSW system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RHRSW system performs functions that support fire protection, ATWS, and EQ. LRA Table 2.3.3-26 identifies RHRSW system component types within the scope of license renewal and subject to an AMR.

2.3.3.27.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.27, UFSAR Section 9.2.6, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. In addition to RAIs 2.3.3.27-1 and 2.3.3.27-2 related to boundary drawing continuation errors discussed in SER Section 2.3.3, the applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.27-3, dated August 27, 2007, the staff noted that boundary drawing LR-M-2112-1, location F7 depicts pipe sections downstream of PSV21213B and PSV21212B that are not within the scope of license renewal. However, similar components downstream of PSV21213A and PSV21212A are within the scope of license renewal. the staff requested that the applicant explain why these nonsafety-related piping and components connected to safety-related components downstream of PSV21213B and PSV21212B are not within the scope of license renewal.

In its response to RAI 2.3.3.27-3, dated October 18, 2007, the applicant stated:

> The pipe sections downstream of PSV21213B and PSV21212B, labeled as going to "LRW", are within the scope of license renewal based on 10 CFR 54.4(a)(2) as nonsafety-related for spatial interaction and are subject to AMR. The highlighting was inadvertently missed and these two pipe sections have been highlighted in Revision 1 to drawing LR-M-2112-1. Since this is a highlighting omission, and the materials and environments are already included in LRA Section 2.3.3.27, no LRA changes are needed.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-2112-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.27-3 acceptable because the applicant has clarified that these pipe sections are within scope of license renewal and has revised the applicable boundary drawings. Therefore, the staff's concern described in RAI 2.3.3.27-3 is resolved.

In RAI 2.3.3.27-4, dated August 27, 2007, the staff noted that boundary drawing LR-M-112-2, Revision 1, locations D3 and D8 show RHRSW piping from three-inch JRD-31 and three-inch JRD-32 to the vault sump and to valves 012040 and 012041, respectively, as not within the scope of license renewal. The staff requested that the applicant explain why these sections of piping are not within the scope of license renewal.

In its response to RAI 2.3.3.27-4, dated January 3, 2008, the applicant stated:

> The three-inch pipe lines JRD -31 and JRD-32 have been abandoned in place. These pipe sections do not contain any fluid that could interact with surrounding equipment. These three-inch lines are in-scope because they are connected to and provide structural support for the connected safety-related piping. The one-inch piping and the valves 012031, 013030, 012038, and 012041 that are connected to the three inch pipe lines JRD-31 and JRD-32 do not provide any structural support function for the three-inch JRD -31 and JRD-32 piping or the safety-related piping connected to the three-inch pipe lines JRD -31 and JRD-32. Therefore, neither the one inch piping nor the associated valves are within the scope of license renewal for license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.27-4 acceptable because the applicant has clarified that this piping does not contain any fluid that could interact with surrounding equipment and that the one-inch lines and valves off of three-inch JRD-31 and three-inch JRD-32 do not provide any structural support function. Therefore, the staff's concern described in RAI 2.3.3.27-4 is resolved.

2.3.3.27.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings (original and revised) to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the RHRSW system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the RHRSW system mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.28 Sampling System

2.3.3.28.1 Summary of Technical Information in the Application

LRA Section 2.3.3.28 describes the sampling system, which monitors the operation of plant equipment for information needed to make operational decisions. The failure of nonsafety-related SSCs in the sampling system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-27 identifies sampling system component types within the scope of license renewal and subject to an AMR.

2.3.3.28.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the sampling system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.29 Sanitary Drainage *System*

2.3.3.29.1 Summary of Technical Information in the Application

LRA Section 2.3.3.29 describes the sanitary drainage system (SDS), which collects liquid wastes from all plumbing fixtures of the plant outside restricted access areas. The drain lines were designed to accommodate fire protection system design flow when actuated. The failure of nonsafety-related SSCs in the SDS potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-28 identifies SDS component types within the scope of license renewal and subject to an AMR.

2.3.3.29.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the SDS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.30 Service Air System

2.3.3.30.1 Summary of Technical Information in the Application

LRA Section 2.3.3.30 describes the service air system (SAS), which provides compressed air for service air outlets located throughout the plant and a backup system for instrument air. The failure of nonsafety-related SSCs in the SAS potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-29 identifies SAS component types within the scope of license renewal and subject to an AMR.

2.3.3.30.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the SAS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.31 Service Water System

2.3.3.31.1 Summary of Technical Information in the Application

LRA Section 2.3.3.31 describes the SWS, which removes heat from heat exchangers in the control structure and turbine, reactor, and radwaste buildings, and transfers it to the cooling towers where it is dissipated. The failure of nonsafety-related SSCs in the SWS potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-30 identifies SWS component types within the scope of license renewal and subject to an AMR.

2.3.3.31.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.31, UFSAR Section 9.2.1.2, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. In addition to RAI 2.3.3.31-2 related to boundary drawing continuation errors discussed in LRA Section 2.3.3, the applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.31-1, dated August 27, 2007, the staff noted that boundary drawing LR-M-110-1, locations G2 and G3 show pipe tunnel coolers (1A, 1B, 1C, and 1D) that are not within the scope of license renewal. The staff requested that the applicant explain why the pipe tunnel coolers are not within the scope of license renewal.

In its response to RAI 2.3.3.31-1, dated October 18, 2007, the applicant stated:

> The pipe tunnel coolers (1A, 1B, 1C, and 1D) are within the scope of license renewal under criteria 10 CFR 54.4(a)(2). The components which are subject to aging management review are those that may contain a liquid and have the potential for spatial interaction. Therefore, the channels/heads for the unit coolers are subject to aging management review. The pipe tunnel unit cooler channels/head are addressed as components of the Reactor Building HVAC System and are included in LRA Table 2.3.3-23 under the line item "Unit coolers, drain pans, drain piping, channels/heads" with an intended function of structural integrity.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-110-1 to indicate that pipe tunnel coolers (1A, 1V, 1C, and 1D) are within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.31-1 acceptable because the applicant has clarified that the pipe tunnel coolers are within the scope of license renewal and subject to AMR. The staff confirms that the applicant has revised the boundary drawing to reflect this change. Therefore, the staff's concern described in RAI 2.3.3.31-1 is resolved.

In RAI 2.3.3.31-3, dated August 27, 2007, the staff noted boundary drawing LR-M-2110-1, locations G2 and G3 show pipe tunnel coolers (2A, 2B, 2C, and 2D) that are within the scope of license renewal. LRA Table 2.3.3-30, "Service Water System Components Subject to Aging Management Review," does not list coolers as a component subject to an AMR. The staff requested that the applicant explain why these pipe tunnel coolers are not included in LRA Table 2.3.3-30.

In its response to RAI 2.3.3.31-3, dated October 18, 2007, the applicant stated:

> Pipe Tunnel Coolers (2A, 2B, 2C, and 2D), shown on drawing LR-M-2110-1 at G2 and G3, are within the scope of license renewal and are subject to AMR. Based on PPL's scoping methodology, these cooling coils have been scoped as part of the Reactor Building HVAC Systems and are included, based on 10 CFR 54.4(a)(2), in LRA Section 2.3.3.24 and associated Table 2.3.3-23. These pipe tunnel coolers are included on LRA page 2.3-99 as part of the last line item of Table 2.3.3-23, with a component type of "Unit Coolers, drain pans, drain piping,

channels/heads” with an intended function of “Structural Integrity”.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.31-3 acceptable because the applicant has clarified that the pipe tunnel coolers are within the scope of license renewal and subject to AMR. Therefore, the staff’s concern described in RAI 2.3.3.31-3 is resolved.

2.3.3.31.3 Conclusion

The staff reviewed the LRA, UFSAR, boundary drawings, and RAI responses to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff’s review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the SWS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the SWS mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.32 Standby Liquid Control System

2.3.3.32.1 Summary of Technical Information in the Application

LRA Section 2.3.3.32 describes the SLC system, an independent, diverse backup to the control rod drive system. The SLC system function is to inject a neutron-absorbing solution into the reactor to achieve and maintain sub-criticality if control rods cannot be inserted manually. The SLC system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the SLC system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the SLC system performs functions that support ATWS and EQ. LRA Table 2.3.3-31 identifies SLC system component types within the scope of license renewal and subject to an AMR.

2.3.3.32.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.32 and UFSAR Section 9.3.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff’s review identified areas in which additional information was necessary to complete the review of the applicant’s scoping and screening results. The applicant responses to the staff’s RAIs as discussed below.

In RAI 2.3.3.32-1, dated October 24, 2007, the staff noted boundary drawing LR-M-148-1 shows the ventilation lines from the test tanks and storage tanks as not within the scope of license renewal. The staff requested that the applicant clarify whether the lines are within the scope of license renewal and subject to an AMR and; if excluded, provide justification.

In its response to RAI 2.3.3.32-1, dated November 14, 2007, the applicant stated:

> The standby liquid control test tank (1/2T203) and ventilation line are nonsafety-related. The test tank provides support for nonsafety-related piping attached to safety-related piping and is therefore within the scope of license renewal. The ventilation line for the test tank is not attached to

safety-related piping and does not contain a fluid that could cause a spatial interaction with safety-related equipment. Therefore, the test tank ventilation line is not within the scope of license renewal.

> The standby liquid control storage tank (1/2T204) is safety-related. Further evaluation by the applicant has been determined that the ventilation line for the storage tank should be within the scope of license renewal and subject to AMR. The ventilation line is evaluated as part of the storage tank pressure boundary and is therefore addressed under the "Tanks, SLC storage tanks (1/2T204)" in Table 2.3.3-31. The evaluation for the storage tank in Table 3.3.2-31 encompasses the vent line. No changes to the LRA were required.

The staff confirms that the applicant has submitted revised boundary drawings LR-M-148-1 and LR-M-2148-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.32-1 acceptable because the applicant has justified not including the test tank ventilation line within the scope of license renewal and has identified the ventilation line for the standby liquid control storage tank as within the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.31-3 is resolved.

In RAI 2.3.3.32-2, dated October 24, 2007, that staff noted boundary drawing LR-M-148-1 shows what appears to be a hatch on the SLC storage tank (1T204). It was unclear to the staff whether the hatch and closure mechanism were included as part of the tank. The staff requested that the applicant clarify whether the tank hatches and closure mechanisms are within the scope of license renewal and subject to an AMR. Also, the staff requested that the applicant revise LRA Table 2.3.3-31, as necessary, to reflect its response or explain under what component they were included.

In its response to RAI 2.3.3.32-2, dated November 14, 2007, the applicant stated:

> The SLC storage tank hatches shown on boundary drawings LR-M-148-1 and LR-M-2148-1 are within the scope of license renewal. The highlighting of the hatches on drawings LR-M-148-1 and LR-M-2148-1 was inadvertently omitted.
>
> The hatches, including the closure mechanisms, are considered to be part of the pressure boundary of the storage tanks. The hatches are included in the line item "Tanks, SLC storage tanks (1/2T204)" in LRA Table 2.3.3-31 as subject to AMR. The closure mechanisms are included in the line item "Bolting" in LRA Table 2.3.3-31 as subject to aging management review. No changes to the LRA were required.

The staff confirms that the applicant has revised boundary drawings LR-M-148-1 and LR-M-2148-1.

2.3.3.32.3 Conclusion

The staff reviewed the LRA, UFSAR, drawings (original and revised), and RAI responses to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the SLC system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the SLC mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.3.33 Turbine Building Closed Cooling Water System

2.3.3.33.1 Summary of Technical Information in the Application

LRA Section 2.3.3.33 describes the TB closed cooling water (TBCCW) system, which is a closed-loop cooling system that transfers heat from miscellaneous turbine plant components to the SWS through the TBCCW heat exchangers. The failure of nonsafety-related SSCs in the TBCCW system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.3-32 identifies TBCCW system component types within the scope of license renewal and subject to an AMR.

2.3.3.33.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.33, UFSAR Section 9.2.3, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.3.33-1 dated August 27, 2007, the staff noted that the TBCCW system was determined to meet the scoping criteria pursuant to 10 CFR 54.4(a)(2) to maintain the integrity of nonsafety-related piping components required to support the safety-related functional boundary of the SWS. This is shown in SWS boundary drawings LR-M-109-2 and LR-M-2109-2. However, boundary drawings defining the license renewal boundaries and components subject to an AMR were not provided. The staff requested that the applicant provide boundary drawings or documentation for the TBCCW system licensing renewal boundaries and components identified in LRA Section 2.3.3.33.

In its response dated October 18, 2007, the applicant stated:

> The only components in-scope for the TBCCW system are the heat exchanger shell (including channels/heads), connected piping and bolting which provide a nonsafety affecting safety anchor for the Emergency Service Water System. The TBCCW components within the scope of license renewal (highlighted pink (magenta)) are depicted on Service Water System boundary drawings LR-M-109-2 and on LR-M-2109-2 which best illustrates the connection to the Emergency Service Water System Piping 4" HRC-114/214 and 4" HRC-134/234.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.33-1 acceptable because the applicant has clarified that the TBCCW components within the scope of license renewal are adequately identified in SWS boundary drawings. Therefore, the staff's concern described in RAI 2.3.3.33-1 is resolved.

2.3.3.33.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and boundary drawings (original and revised) to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the TBCCW system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the TBCCW system mechanical components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

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 Auxiliary boiler system
- 2.3.4.2 Bypass steam system
- 2.3.4.3 Condensate transfer and storage system
- 2.3.4.4 Condenser and air removal system
- 2.3.4.5 Feedwater system
- 2.3.4.6 Main steam system
- 2.3.4.7 Main turbine system
- 2.3.4.8 Makeup demineralizer system
- 2.3.4.9 Makeup transfer and storage system
- 2.3.4.10 Reactor feed pump turbines system
- 2.3.4.11 Refueling water transfer and storage system

2.3.4.1 Auxiliary Boiler System

2.3.4.1.1 Summary of Technical Information in the Application

LRA Section 2.3.4.1 describes the auxiliary boiler (AB) system, which has two boilers that supply steam to various plant processes. The failure of nonsafety-related SSCs in the AB system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.4-1 identifies AB system component types within the scope of license renewal and subject to an AMR.

2.3.4.1.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the AB system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.2 Bypass Steam System

2.3.4.2.1 Summary of Technical Information in the Application

LRA Section 2.3.4.2 describes the bypass steam system, which bypasses MS directly to the condenser to control reactor pressure under certain normal operating conditions. The failure of nonsafety-related SSCs in the bypass steam system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.4-2 identifies bypass steam system component types within the scope of license renewal and subject to an AMR.

2.3.4.2.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the bypass steam system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.3 Condensate Transfer and Storage *System*

2.3.4.3.1 Summary of Technical Information in the Application

LRA Section 2.3.4.3 describes the condensate transfer and storage (CTS) system, which consists of an atmospheric condensate storage tank for each unit, two condensate transfer pumps, a common atmospheric refueling water storage tank for both units, and two refueling water pumps. The failure of nonsafety-related SSCs in the CTS system potentially could prevent the satisfactory accomplishment of a safety-related function. The CTS system also performs functions that support fire protection, ATWS, and SBO. LRA Table 2.3.4-3 identifies CTS system component types within the scope of license renewal and subject to an AMR.

2.3.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.3, UFSAR Section 9.2.10, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAIs 2.3.4.3-1 and 2.3.4.3-2, dated August 27, 2007, the staff noted instances where certain piping was shown within the scope of license renewal on one boundary drawing but shown not within the scope of license renewal when continued on another boundary drawing.

The staff requested that the applicant explain why the sections of pipe in question are not within the scope of license renewal on both boundary drawings.

In its response to RAIs 2.3.4.3-1 and 2.3.4.3-2, dated October 18, 2007, the applicant corrected the inconsistency by clarifying what portion of the piping is within the scope of license renewal.

The staff confirms that the applicant has submitted corrected boundary drawings which highlight sections of piping that are within the scope of license renewal.

Based on its review, the staff finds the applicant’s response to the RAIs 2.3.4.3-1 and 2.3.4.3-2 acceptable because the applicant has clarified that the piping in question is within the scope of license renewal and subject to AMR and has revised the affected boundary drawings to identify the license renewal boundaries. Therefore, the staff’s concern described in RAIs 2.3.4.3-1 and 2.3.4.3-2 is resolved.

In RAI 2.3.4.3-3, dated August 27, 2007, the staff noted boundary drawing LR-M-118-3, location A7, shows demineralized water piping four-inch JCD-59 as not within the scope of license renewal. Its continuation on boundary drawing LR-M-108-1, location C10, is shown as within the scope of license renewal. The staff requested that the applicant explain why this section of pipe is not within the scope of license renewal.

In its response to RAI 2.3.4.3-3, dated October 18, 2007, the applicant stated in part:

> The inconsistency in highlighting the portion of piping 4” JCD-59 located on LR-M-108-2 at C10 was identified during a previous drawing review and the highlighting has been corrected. The portion of 4” JCD-59 that is within the scope of license renewal and subject to AMR extends from condensate storage tank 0T522B, shown on LR-M-108-1 at B8, back to the penetration from the turbine building, shown at C9. The portion upstream of that penetration, back to the continuation arrow from “M-118-3 A7”, shown at C10, is in the turbine building and therefore, as described in LRA Section 2.1.1.2.2, is not within the scope of license renewal. The portion of JCD-59 between the continuation arrow and the penetration from the turbine building should not have been highlighted. 4” JCD-59, from and including the continuation arrow on LR-M-108-1 at C10 to the penetration at C9, is no longer highlighted.

The staff confirms that the applicant has submitted revised boundary drawing LR-M-108-1.

Based on its review, the staff finds the applicant’s response to RAI 2.3.4.3-3 acceptable because the applicant has clarified that the piping within the TB is not within the scope of license renewal and has revised boundary drawing LR-M-108-1. Therefore, the staff’s concern described in RAI 2.3.4.3-3 is resolved.

In RAI 2.3.4.3-4, dated August 27, 2007, the staff noted boundary drawing LR-M-108-1, location B2, includes license renewal note C regarding RWST 0T501. It states, “Refueling Water Storage Tank could flood the adjacent condensate storage area containing safety-related instruments.” The tank is shown within the scope of license renewal; however, none of the piping penetrations or piping connected to the tank is within the scope of license renewal. The staff requested that the applicant explain why piping penetrations and connected piping are not within the scope of license renewal.
In its response to RAI 2.3.4.3-4, dated October 18, 2007, the applicant stated:

> The refueling storage area and Unit 1 condensate storage area are located outdoors and surrounded by walls that form a common berm/retention basin. The berm/retention basin is designed to retain the total volume of water contained in both the refueling water storage tank

> (RWST) and the Unit 1 CST if both tanks rupture simultaneously. The basin includes a sump along the west wall, near the RWST, and the safety-related SCs in the condensate storage area (i.e., level instrumentation associated with HPCI/RCIC supply) are located in the southeast corner, with the CST between them and the RWST and associated piping. As such, spray or leakage from the RWST and associated piping in the storage areas will not impair or prevent the accomplishment of a safety-related function, but would drain to the sump. However, rupture of the RWST would flood the retention basin to a level that could, conservatively, result in spatial interaction with the safety-related SCs in the condensate storage area.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.3-4 acceptable because the applicant has clarified that a berm and/or retention basin is designed to retain the total volume of water contained in both the RWST and the Unit 1 CST, if both tanks simultaneously rupture. Therefore, the staff's concern described in RAI 2.3.4.3-4 is resolved.

In RAI 2.3.4.3-5, dated August 27, 2007, the staff noted boundary drawing LR-M-108-1, locations G6 and H6, shows condensate transfer pump discharge lines as being within the scope of license renewal; however, the recirculation lines, two-inch HCD-13, between check valves 008043 and 008053 and four-inch HCD-13 are shown as not within the scope of license renewal. The staff requested that the applicant explain why these pipe sections are not within the scope of license renewal.

In its response to RAI 2.33.4.3-5, dated October 18, 2007, the applicant stated:

> The condensate transfer pumps and the associated discharge lines are within the scope of license renewal because they are required to supply the ECCS and RCIC keep fill system to prevent water hammer whenever operation of these systems is initiated for mitigation of fire and station blackout events, thus meeting the scoping criteria of 10 CFR 54.4(a)(3). However, the flowpath from the condensate transfer pumps back to the condensate storage tank (0T522A) is not required to support this (a)(3) function. It has also been determined that failure of this flowpath will not prevent the accomplishment of an (a)(1) function, as it is not connected to nor located near safety-related SSCs.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.3-5 acceptable because the applicant has clarified that the piping in question is not required to support the fire protection function for SBO events, pursuant to 10 CFR 54.4(a)(3). Therefore, the staff's concern described in RAI 2.3.4.3-5 is resolved.

In RAI 2.3.4.3-6, dated August 27, 2007, the staff noted boundary drawing LR-M-108-1, location H5, shows piping one-inch HCD-9 from six-inch HCD-9 to valve 008051 as being not within the scope of license renewal. The staff requested that the applicant explain why this section of pipe is not within the scope of license renewal.

In its response to RAI 2.3.4.3-6, dated October 18, 2007, the applicant stated the one-inch HCD piping from the six-inch HCD-9 piping line to valve 008051 is within the scope of license renewal. The staff confirms that the applicant has submitted revised boundary drawing LR-M-108-1 placing this piping within the scope of license renewal, in accordance with 10 CFR 54.4(a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.4.3-6 acceptable because the applicant has clarified that the subject piping is within the scope of license renewal and subject to an AMR and has revised boundary drawing LR-M-108-1 to identify the revised license renewal boundary. Therefore, the staff's concern described in RAI 2.3.4.3-6 is resolved.

2.3.4.3.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings (original and revised) to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the CTS system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the CTS system mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.4.4 Condenser and Air Removal System

2.3.4.4.1 Summary of Technical Information in the Application

LRA Section 2.3.4.4 describes the condenser and air removal system. The failure of nonsafety-related SSCs in the condenser and air removal system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.4-4 identifies condenser and air removal system component types within the scope of license renewal and subject to an AMR.

2.3.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.4, UFSAR Sections 10.4.1 and 10.4.2, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.4.4-1, dated August 27, 2007, the staff noted that boundary drawing LR-M-141-1 (2141-1), location E9 shows this line highlighted in green as it exits the steam tunnel and enters the TB. However, the downstream line is not highlighted on LR-M-105-2 (2105-2), location B1, where it connects to condenser shell 1A (penetration 88). The staff requested that the applicant explain why these pipe sections and components are not within scope for license renewal.

In its response to RAI 2.3.4.4-1, dated October 18, 2007, the applicant stated that the piping in question, four-inch EAD-114 on boundary drawing LR-M-105-2, from continuation arrow M-141-1 E9 located at B1 to HP condenser shell -1A, penetration 88 is within the scope of license renewal and is subject to AMR. The staff confirms that the applicant has submitted revised boundary drawings LR-M-105-2 and LR-M-2105-2 that show this piping within the scope of license renewal, pursuant to 10 CFR 54.4(a)(1).

Based on its review, the staff finds the applicant's response to RAI 2.3.4.4-1 acceptable because the applicant has clarified that the piping in question is within the scope of license renewal and subject to AMR and has submitted two revised boundary drawings that identify the license renewal boundaries. Therefore, the staff's concern described in RAI 2.3.4.4-1 is resolved.

2.3.4.4.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and boundary drawings (original and revised) to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the condenser and air removal system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the condenser and air removal system mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.4.5 Feedwater *System*

2.3.4.5.1 Summary of Technical Information in the Application

LRA Section 2.3.4.5 describes the feedwater system (FWS), which supplies high-purity, preheated feedwater to the RV at the flow and pressure required to maintain the desired RV water level throughout the entire operating range from startup to full load to shutdown. The FWS contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the FWS potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the FWS performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.4-5 identifies FWS component types within the scope of license renewal and subject to an AMR.

2.3.4.5.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the FWS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.6 Main Steam *System*

2.3.4.6.1 Summary of Technical Information in the Application

LRA Section 2.3.4.6 describes the MSS, which transports high-pressure steam generated in the RPV to the main turbine through four MS lines, each line with a main stop and turbine control valve. The MSS contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the MSS potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the MSS performs functions that support fire protection, ATWS, SBO, and EQ. LRA Table 2.3.4-6 identifies MSS component types within the scope of license renewal and subject to an AMR.

2.3.4.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.6, UFSAR Section 10.3, and the licensing renewal boundary drawings using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff's review identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.4.6-1, dated August 27, 2007, the staff noted that the boundary drawings LR-M-141-1, LR-M-101-1, LR-M-101-3 and LR-M-2141-1, LR-M-2101-1, LR-M-2101-3 show several ASME Code Section III, Class 2 lines that are identified within scope of license renewal but are not shown as safety-related, in accordance with the notation legend on boundary drawing LR-M-100-4, Note A2. The staff requested that the applicant clarify whether these lines are within the scope of license renewal, pursuant to 10 CFR 54.4(a) (1) and; if not, provide an explanation.

In its response to RAI 2.3.4.6-1, dated October 18, 2007, the applicant stated:

> The piping noted in this RAI on license renewal drawings LR-M-141-1, LR-M-101-1, and LR-M-101-3 includes the 4 main steam lines from the outermost isolation valves to the turbine stop valves, 24" DBB-101, 102, 103 & 104, and the turbine bypass lines, 24"DBB-105 and 18" DBB-105. License renewal boundary drawings LR-M-2141-1, LR-M-2101-1, LR-M-2101-3 include 24" DBB-201, 202, 203 & 204, and the turbine bypass lines, 24"DBB-205 and 18" DBB-205. Reference LR-M-100-2 at E3, PPL's drawing convention is to "cross-hatch" pipelines that are safety-related. Note, the lack of "cross-hatching" indicates that these lines are not safety-related.
>
> As stated in FSAR Section 10.3.1, Design Bases, the main steam supply system has no safety-related function, but is designed to supply required steam to the turbine generator and bypass steam to the condenser. FSAR Section 10.3.2 states the main steam piping is designed to ASME Section III Class 2. FSAR Table 3.2-1 classifies the main steam piping beyond the outermost isolation valve to the turbine stop valves as ASME Section III, Class 2, but shows that this piping is not within the scope of 10 CFR 50 Appendix B.
>
> FSAR Section 10.4.4 likewise notes the bypass system has no safety-related function and the piping is designed in accordance with ASME Section III, Class 2.
>
> Therefore, as indicated in the FSAR, the main steam piping, through to the main stop valves and to the bypass valve chest is designed as ASME Section III, Class 2, but is not classified as safety-related.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-1 acceptable because the applicant has clarified that the piping in question is nonsafety-related and within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2) and in agreement with UFSAR Sections 10.3.1 and 10.4.4. Therefore, the staff's concern described in RAI 2.3.4.6-1 is resolved.

In RAI 2.3.4.6-2, dated August 27, 2007, the staff noted that the boundary drawings LR-M-141-1, and LR-M-2141-1, locations A-7 upstream of 141F029A and 241F029A show sections of ASME Code Section III, Class 3 pipe as within scope of license renewal for nonsafety-related spatial effects, in accordance with 10 CFR 54.4(a)(2) and as described in boundary drawing LR-M-100, note A2 on Sheet 4. Since ASME Code Class 3 components are described in RG 1.26, Quality Group C as safety-related, the staff requested that the applicant explain why these sections of pipe are not within the scope of license renewal, pursuant to 10 CFR 54.4(a)(1).

In its response to RAI 2.3.4.6-2, dated October 18, 2007, the applicant stated in part:

> FSAR Table 3.2-1 under the "Nuclear Boiler System" heading indicates the air supply check valves and the piping downstream of the air supply check valves is safety-related. The piping upstream of the air supply check valves is not safety-related and has no safety-related function. The short section of stainless steel piping attached to the air supply check valve allows use of an insulating flange to connect two different materials. A portion of the non safety-related piping upstream of the check valve is in-scope as it contains an anchor that provides support for the safety-related valve and is thus within the scope of license renewal based on 10 CFR 54.4(a)(2), and subject to AMR.

The staff confirms that the applicant has submitted revised boundary drawings LR-M-141-1 and LR-M-214-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-2 acceptable because the applicant has clarified that the piping in question is nonsafety-related and within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2) and is in agreement with UFSAR Table 3.2-1. Therefore, the staff's concern described in RAI 2.3.4.6-2 is resolved.

In RAI 2.3.4.6-3, dated August 27, 2007, the staff noted that the boundary drawing LR-M-101-1, locations A6, C6, E6, F6, and G-2, and LR-M-2101-1, locations A6, C6, E6, F6, and G-2 show one-inch instrumentation pipes and the first normally open manual isolation valve within the scope of license renewal. Boundary drawing LR-M-100, Sheet 4, note A2 suggests that the intended function of these pipes is pressure boundary. However, the connecting downstream piping is not shown as within the scope of license renewal. Since failure of the downstream pipe will have the same effect as failure of the in-scope piping, the staff requested that the applicant explain why the downstream piping also is not included within the scope of license renewal.

In its response to RAI 2.3.4.6-3, dated October 18, 2007, the applicant stated:

> The main stop valves on license renewal drawings LR-M-101-1 and LR-M-2101-1 form the boundary associated with providing an alternate pathway for main steam isolation valve (MSIV) leakage, as described in LRA Section 2.3.4.6. The MSIV Leakage Isolated Condenser Treatment Method (ICTM) directs any leakage through a closed MSIV to the main condenser. This is a nonsafety-related function in accordance with 10 CFR 54.4(a)(2).
>
> The intended function is to provide a flow path rather than a pressure boundary. Therefore, the ICTM boundary is established at the first isolation valve associated with instrumentation for the stop valves, drip legs, and sensing lines in order to depict the boundaries of the path. Flow is not expected in the instrument lines and any leakage from the instrument lines would be inconsequential to the overall volume available for hold-up and plate-out of fission products.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-3 acceptable because the applicant has clarified that the intended function of the piping in question is to provide a flow path rather than a pressure boundary. Therefore, the staff's concern described in RAI 2.3.4.6-3 is resolved.

In RAI 2.3.4.6-4, dated August 27, 2007, the staff noted that the boundary drawing LR-M-101-1, locations B-8, D-8, E-8, and G-8, and LR-M-2101-1, locations B-8, D-8, E-8, and G-8, show the 28-inch lines as nonsafety-related and are considered within the scope of license renewal for spatial effects. However, no portion of the nonsafety-related lines connecting the 28-inch lines to control valve MS lead drain is shown as within the scope of license renewal for the same spatial effects. The staff requested that the applicant explain why these lines are not included within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2).

In its response to RAI 2.3.4.6-4, dated October 18, 2007, the applicant stated:

> LRA Section 2.3.4.7, Main Turbine, states that the High Pressure (HP) Turbine Casing and associated bolting are in-scope. The HP Turbine Casing and bolting are in-scope because they provide structural support (anchor to plant structure) for Main Steam System piping extending from the reactor building into the turbine building. As such, the casing of the HP turbine has the potential for interaction (connected to) with safety-related components and is in-scope based on 10 CFR 54.4(a)(2). Because the HP Turbine Casing serves as an anchor, the Main Steam System piping is brought into scope based on the seismic analysis boundary extending all the way back to the containment penetration. The small branch piping off the Main Steam System was not included in the seismic evaluation of the Main Steam piping because this piping is non-Q and by specification, Bechtel Specification M406, Piping Stress Analysis for SSES, Section 5.11) it is too small to have a significant effect. Also, refer to boundary drawing LR-M-101-1, LR Note D which addresses anchors for pipelines less than 2 ½" in diameter. In addition, the Main

> Steam System small branch piping is not in-scope due to spatial interaction (wetting, spray, leakage, flooding) based on SSES LRA Section 2.1.1.2.2.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-4 acceptable because the applicant has verified that the small branch piping off the MSS was not included in the seismic evaluation of the MS piping because this piping is non-Q and was not included in the piping stress analysis. Therefore, the staff's concern described in RAI 2.3.4.6-4 is resolved.

In RAI 2.3.4.6-5, dated August 27, 2007, the staff noted that the boundary drawing LR-M-101-1, locations B-7, C-7, E-7, and F-7, and LR-M-2101-1, locations B-7, C-7, E-7, and F-7, show CV-1, CV-2, CV-3, and CV-4 as nonsafety-related and within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2). There are several nonsafety related lines that are connected to the CV-1, CV-2, CV-3, and CV-4 valve pressure boundaries; however, no portion of these connecting lines are shown as within the scope of license renewal. The staff requested that the applicant explain why these lines are not included within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2).

In its response to RAI 2.3.4.6-5, dated October 18, 2007, the applicant stated:

> LRA Section 2.3.4.7, Main Turbine, states that the High Pressure (HP) Turbine Casing and associated bolting are in-scope. The HP Turbine Casing and bolting are in-scope because they provide structural support (anchor to plant structure) for Main Steam System piping extending from the reactor building into the turbine building. As such, the casing of the HP turbine has the potential for interaction (connected to) with safety-related components and is in-scope based on 10 CFR 54.4(a)(2). Because the HP Turbine Casing serves as an anchor, the Main Steam System piping is brought into scope based on the seismic analysis boundary extending all the way back to the containment penetration. The small branch piping off the Main Steam System was not included in the seismic evaluation of the Main Steam piping because this piping is non-Q and by specification, Bechtel Specification M406, Piping Stress Analysis for SSES, Section 5.11, it is too small to have a significant effect. Also, refer to boundary drawing LR-M-101-1, LR Note "D" which addresses anchors for pipelines less than 2 ½" in diameter. In addition, the Main Steam System small branch piping is not in-scope due to spatial interaction (wetting, spray, leakage, flooding) based on SSES LRA Section 2.1.1.2.2.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-5 acceptable because the applicant has verified that the small branch piping off the MSS was not included in the seismic evaluation of the MS piping because this piping is non-Q and was not included in the piping stress analysis. Therefore, the staff's concern described in RAI 2.3.4.6-5 is resolved.

In RAI 2.3.4.6-6, dated August 27, 2007, the staff noted that the boundary drawings LR-M-141-1 and LR-M-2141-1, Revision 1, location C-8, show piping downstream of normally closed manual isolation valves 141010A and 241010A as ASME Code Section III, Class 2 pipe. However, this piping is identified as within the scope for license renewal as a nonsafety-related pipe, pursuant to 10 CFR 54.4(a)(2). The staff requested that the applicant explain why these sections of pipe are not within the scope of license renewal, in accordance with 10 CFR 54.4(a)(1).

In its response to RAI 2.3.4.6-6, dated October 18, 2007, the applicant stated:

> As stated in FSAR Section 10.3.1, Design Bases, the main steam supply system has no safety-related function, but is designed to supply required steam to the turbine generator and bypass steam to the condenser. FSAR Section 10.3.2 states the main steam piping is designed to ASME Section III Class 2. FSAR Table 3.2-1 classifies the main steam piping beyond the outermost isolation valve to the turbine stop valves, including the piping to and the normally closed isolation valves 141010A and 241010A, as ASME Section III, Class 2, but shows that this piping is not within the scope of 10 CFR 50 Appendix B.
>
> FSAR Section 10.4.4 likewise notes the bypass system has no safety-related function and the piping is designed in accordance with ASME Section III, Class 2.
>
> The piping downstream of normally closed manual isolation valves 141010A and 241010A is ASME Section III Class 2 pipe, and has no safety-related function. Therefore, this piping does not meet 10 CFR 54.4(a)(1) scoping criteria. This piping could contain water and is therefore within the scope of license renewal based on 10 CFR 54.4(a)(2), due to the potential for spatial interaction.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-6 acceptable because the applicant has clarified that the piping in question is nonsafety-related and within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2) and is in agreement with UFSAR Table 3.2-1 and Section 10.4.4. Therefore, the staff's concern described in RAI 2.3.4.6-6 is resolved.

In RAI 2.3.4.6-7, dated August 27, 2007, the staff noted that the boundary drawings LR-M-141-1, and LR-M-2141-1, Revision 1, locations C-7 and F-7 show piping downstream of normally closed manual isolation valves 14138A/24138A, 14101A/24101A, and 14101B/24101B that appear to be ASME Code Section III, Class 2 pipe. However, these piping components are identified within the scope of license renewal as nonsafety-related, pursuant to 10 CFR 54.4(a)(2). The staff requested that the applicant explain why these sections of pipe are not within the scope of license renewal, in accordance with 10 CFR 54.4(a)(1).

In its response to RAI 2.3.4.6-7, dated October 18, 2007, the applicant stated:

> As stated in FSAR Section 10.3.1, Design Bases, the main steam supply system has no safety-related function, but is designed to supply required steam to the turbine generator and bypass steam to the condenser. FSAR Section 10.3.2 states the main steam piping is designed to ASME Section III Class 2. FSAR Table 3.2-1 classifies the main steam piping beyond the outermost isolation valve to the turbine stop valves, including the piping to and the normally closed isolation valves 14138A/24138A, 14101A/24101A, and 14101B/24101B, as ASME Section III Class 2, but shows that this piping is not within the scope of 10 CFR 50 Appendix B.

> FSAR Section 10.4.4, likewise, notes the bypass system has no safety-related function and the piping is designed in accordance with ASME Section III Class 2.
>
> The piping downstream of normally closed manual isolation valves 14138A/24138A, 14101A/24101A, and 14101B/24101B is ASME Section III Class 2 pipe, and has no safety-related function. Therefore, this piping does not meet 10 CFR 54.4(a)(1) scoping criteria. This piping could contain water and is therefore within the scope of license renewal based on 10 CFR 54.4(a)(2), due to the potential for spatial interaction.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-7 acceptable, because the applicant has clarified that the piping in question is nonsafety-related and within the scope of license renewal, pursuant to 10 CFR 54.4(a)(2) and is in agreement with UFSAR Table 3.2-1 and Section 10.4.4. Therefore, the staff's concern described in RAI 2.3.4.6-7 is resolved.

In RAI 2.3.4.6-8, dated August 27, 2007, the staff noted that boundary drawings LR-M-141-1 and LR-M-2141-1, locations A-7 show the nonsafety-related (line class JDD) ANSI B31.1 piping connected to safety-related (line class HCC) ASME Code Section III, Class 3 piping not within the scope of license renewal. In LRA Section 2.1.1.2.2, "Spatial Failures of Nonsafety-Related SSCs," page 2.1-8 the applicant states in part: "With respect to nonsafety-related piping that is directly connected to safety-related piping, the seismic Category I design requirements are extended to the first seismic restraint beyond the defined boundaries." The staff requested that the applicant provide the location of the license renewal boundary (seismic restraint) for the nonsafety-related piping connected to the safety-related piping.

In its response to RAI 2.3.4.6-8, dated October 18, 2007, the applicant verified that the seismic anchor is located between the check valve and insulating flange.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-8 acceptable because the applicant has verified the location of the seismic anchor. Therefore, the staff's concern described in RAI 2.3.4.6-8 is resolved.

2.3.4.6.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and boundary drawings (original and revised) to determine whether the applicant failed to identify any components within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes the applicant has appropriately identified the MSS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the MSS mechanical components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.3.4.7 Main Turbine System

2.3.4.7.1 Summary of Technical Information in the Application

LRA Section 2.3.4.7 describes the main turbine system (MTS), which consists of one double-flow, high-pressure turbine and three double-exhaust flow, low-pressure turbines. The failure of nonsafety-related SSCs in the MTS potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.4-7 identifies MTS component types within the scope of license renewal and subject to an AMR.

2.3.4.7.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the MTS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.8 Makeup Demineralizer System

2.3.4.8.1 Summary of Technical Information in the Application

LRA Section 2.3.4.8 describes the makeup demineralizer system, which provides an adequate supply of demineralized water for the plant operating requirements. The failure of nonsafety-related SSCs in the makeup demineralizer system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.4-8 identifies makeup demineralizer system component types within the scope of license renewal and subject to an AMR.

2.3.4.8.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the makeup demineralizer system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.9 Makeup Transfer and Storage System

2.3.4.9.1 Summary of Technical Information in the Application

LRA Section 2.3.4.9 describes the makeup transfer and storage system, which provides demineralized water makeup to various plant services from the makeup demineralizer system. The failure of nonsafety-related SSCs in the makeup transfer and storage system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.4-9 identifies makeup transfer and storage system component types within the scope of license renewal and subject to an AMR.

2.3.4.9.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the makeup transfer and storage system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.10 Reactor Feed Pump Turbines System

2.3.4.10.1 Summary of Technical Information in the Application

LRA Section 2.3.4.10 describes the reactor feed pump turbines system, which is driven by variable-speed, multistage turbines that receive steam from either the MS cross-connection header or the crossover piping downstream of the moisture separators. The reactor feed pump turbines system performs functions that support fire protection. The only components of the reactor feed pump turbines system within the scope of license renewal are the reactor feed pump turbine low-pressure and high-pressure stop valves. The valve bodies and their internal pilot valves and oil piping/tubing perform no passive intended function. Therefore, there are no reactor feed pump turbines system components subject to an AMR.

2.3.4.10.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the reactor feed pump turbines system mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.11 Refueling Water Transfer and Storage System

2.3.4.11.1 Summary of Technical Information in the Application

LRA Section 2.3.4.11 describes the refueling water transfer and storage system, which stores the water that fills the reactor wells and dryer-separator pools of either Unit 1 or 2. During refueling operations, water inventory is transferred from the storage tank to the reactor wells and dryer-separator pools. The failure of nonsafety-related SSCs in the refueling water transfer and storage system potentially could prevent the satisfactory accomplishment of a safety-related function. LRA Table 2.3.4-10 identifies refueling water transfer and storage system component types within the scope of license renewal and subject to an AMR.

2.3.4.11.2 Conclusion

Based on the results of the staff evaluation discussed in Section 2.3 and on a review of the LRA, UFSAR, and applicable boundary drawings, the staff concludes that applicant has appropriately identified the SDS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.4 Scoping and Screening Results: Structures

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

- Primary containment
- Reactor building
- ES SW pumphouse and spray pond
- CWPH and water treatment building
- Control structure
- DG A, B, C, and D building
- DG E building
- Turbine building
- 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 SCs were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the applicable LRA sections and drawings, focusing on components that have not been identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the UFSAR, for each structure to determine whether the applicant has omitted from the scope of license renewal components with intended functions pursuant to 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions in accordance with 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 (a) the functions are performed with moving parts or a change in configuration or properties or (b) 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.

The staff's review of the introductory scoping portion of LRA Section 2.4 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results and determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a). The applicant responded to the staff's RAIs as discussed below.

In RAI 2.4-1, dated August 3, 2007, the staff noted that LRA Section 2.4, fourth paragraph, first sentence, stated that the major structures included within the scope of license renewal were as listed therein. Pursuant to 10 CFR 54.4, all structures (including major structures) that perform an intended function stated in 10 CFR 54.4(a) are required to be included within the scope of license renewal. The staff requested that the applicant to: (a) confirm that the in-scope structures and structure categories listed in LRA Section 2.4 are all inclusive; (b) clarify the language used in that section of the LRA, "The major structures in the scope..."; and (c) include any remaining structures that may be within the scope of license renewal and provide corresponding scoping, screening and AMR results.

In its response to RAI 2.4-1, dated August 28, 2007, the applicant stated:

> The in-scope structures and structure categories listed in Section 2.4 are all inclusive of the in-scope License Renewal structures required by 10CFR54.4 for SSES. The term "major" was used to categorize the structures to be addressed in different sections of the SSES LRA. All in-scope structures for SSES are listed in the LRA with the Yard Structures category encompassing all the miscellaneous in-scope Yard Structures identified in Section 2.4.9. The in-scope Yard Structures are:
>
> - Clarified Water Storage Tank Foundation
> - Condensate Storage Tank Foundation and Retention Basin (Units 1 and 2)
> - Diesel Generator Fuel Oil Storage Tanks 'A, B, C, D & E' Foundations and Vaults
> - Refueling Water Storage Tank Foundation (Unit 1)
> - Station Blackout component foundations and structures (Startup Transformers
>   T-10 and T-20 and associated disconnect switches, Engineered Safeguards Systems (ESS) Transformers)
> - Cooling Tower Basins (Units 1 and 2)
> - Duct banks, manholes, valve vaults, instrument pits, piping trenches
>
> The first sentence in the fourth paragraph of the license renewal application (LRA) Section 2.4 "Scoping and Screening Results: Structures" is revised in *bold italics* as shown in Attachment 1 of the applicant's letter dated August 28, 2007, to read as follows:
>
> > "The structures in the scope of license renewal are the:"

Based on its review, the staff finds the applicant's response to RAI 2.4-1 acceptable because that applicant has clarified that the structures listed as within the scope of license renewal are all inclusive and has accordingly revised the language in LRA Section 2.4, fourth paragraph, first sentence. Therefore, the staff's concern described in RAI 2.4-1 is resolved.

In RAI 2.4-2, dated August 3, 2007, the staff noted that UFSAR Section 3.8.4 describes the radwaste building as a safety-related non-seismic Category 1 structure. UFSAR Page 3.8-45 states that the reinforced concrete walls and floor and the concrete block masonry walls meet structural as well as radiation shielding requirements. LRA Sections 2.3.3.19 and 2.3.3.20 include the radwaste liquid system and the radwaste solids handling system within the scope of license renewal and subject to an AMR. LRA Section 2.3.3.20, first paragraph states that all radwaste solids handling system equipment serves both reactor units and is located in the radwaste building. However, LRA Table 2.2-3 excludes the radwaste building from the scope of license renewal. Since the above mentioned in-scope systems are located inside the radwaste building, the staff requested that the applicant confirm whether this would bring the radwaste building within the scope of license renewal and subject to an AMR and; if so, include the radwaste building in the LRA and describe its scoping, screening and AMR results. If the radwaste building is excluded, provide the technical basis for the exclusion.

In its response to RAI 2.4-2, dated August 28, 2007, the applicant stated:

> The FSAR Section 3.8.4, title heading is a hold-over from earlier versions of the FSAR, listing of the Radwaste Building as a Safety-Related structure is inconsistent with the reduced quality group classification described in FSAR Table 3.2-1. A Condition Report (CR 893711) has been issued to rectify the FSAR text.
>
> The Radwaste Building is not in the scope of License Renewal at SSES, or subject to aging management review, since it does not contain in-scope components and does not perform an intended function. As shown in FSAR Table 3.2-1, the Radwaste Building and associated components have a Safety Class of "Other," the definition of which is shown in FSAR Section 3.2.3.4. As described in Notes 22 and 31 of FSAR Table 3.2-1, a lower quality group classification, associated construction codes and seismic category were determined to be appropriate for Radwaste Treatment systems (and building) as a result of analysis per Regulatory Guides 1.26 and 1.29, which demonstrated that the site boundary dose would not exceed .5 Rem due to a loss of effluent from system components. This quality group classification conforms to Quality Group D (Augmented) as defined in NRC Branch Technical Position ETSB 11-1.
>
> Table 2.3.3-18 of the LRA identifies the piping, valves, and piping components (e.g., cleanouts and pump casings) of the Radwaste Liquid System that are in the scope of License Renewal and subject to aging management review. These components provide containment isolation or are nonsafety-related components that are required to maintain integrity to prevent spatial interaction with, or support for attached, safety-related components. These components are located in the Reactor Building or Control Structure, as shown on the LR drawings listed in LRA Section 2.3.3.19 (e.g. LR-M-161 Sheet 2), and not in the Radwaste Building. With respect to the Radwaste Solids Handling System, the system description in LRA Section 2.3.3.20 identifies that only the system tanks and associated piping and piping components in the Reactor Building, as shown on drawings LR-M-154, Sheet 1 and LR-M-166, Sheets 1 and 2 are in-scope and subject to aging management review as identified in LRA Table 2.3.3-19.

Based on its review, the staff finds the applicant's response to RAI 2.4-2 acceptable because that applicant has verified that the safety-related description of the radwaste building in UFSAR Section 3.8.4 was in error and has appropriately revised the FSAR text. The staff confirms that the applicant has also verified that its analysis of the radwaste treatment systems (and building), pursuant to RGs 1.26 and 1.29, demonstrated that the site boundary dose would not exceed 0.5 rem due to a loss of effluent from system components. The applicant clarified that the components of the radwaste liquid system and the radwaste solids handling system, described in LRA Sections 2.3.3.19 and 2.3.3.20, that are included within the scope of license renewal and subject to an AMR, are located in the RB or control structure and not in the radwaste building. Since the radwaste Building does not serve an intended function pursuant to 10 CFR 54.4(a), the staff agrees with the applicant's conclusion that the radwaste building is not within the scope of license renewal. Therefore, the staff's concerns described in RAI 2.4-2 are resolved.

Based on the applicant's response to RAIs 2.4-1 and 2.4-2, the staff finds that the applicant's list of structures within the scope of license renewal, in the introductory part of LRA Section 2.4, is all inclusive.

2.4.1 Primary Containment

2.4.1.1 Summary of Technical Information in the Application

In LRA Section 2.4.1, the applicant describes the primary containments, which are GE BWR, Mark II (over/under) type seismic Category I structures. The primary containment is an enclosure for the RV, the reactor coolant recirculation loops, and branch connections of the RCS. Essential elements of the primary containment are the drywell, the suppression chamber that stores a large volume of water, the drywell floor separating the drywell and the suppression chamber, the connecting vent pipe system between the drywell and the suppression chamber, isolation valves, the vacuum relief system, the containment cooling systems, and other service equipment. Primary containment takes the form of a truncated cone over a cylinder, with the drywell in the upper conical section and the suppression chamber in the lower cylindrical section. These two sections comprise a structurally-integrated, reinforced concrete pressure vessel, lined with welded steel plate and with a steel domed head for closure at the top of the drywell. The drywell floor is a reinforced concrete slab, structurally connected to the containment wall.

The primary containment contains safety-related components relied upon to remain functional during and following DBEs. In addition, the primary containment performs functions that support SBO.

LRA Table 2.4.1-1 identifies primary containment component types within the scope of license renewal and subject to an AMR:

- containment liner
- containment wall
- control rod drive removal hatch
- drywell floor
- drywell floor liner
- drywell head
- drywell sumps
- foundation
- penetrations
- permanent drywell shielding
- personnel airlock and equipment hatches

- reactor pedestal
- reactor pedestal liner
- reactor shield doors
- reactor shield wall
- reactor shield wall inner and outer plates
- reactor vessel thermal insulation
- refueling bellows
- refueling seal plate
- refueling seal lead shield plates
- seismic truss and seismic stabilizer
- structural steel: beams, columns, plates, and trusses
- suppression chamber
- suppression chamber access hatches
- suppression chamber columns
- suppression chamber liner

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

- spray shield or curb to direct flow
- thermal expansion, seismic separation, or both
- flood protection barrier
- SBO or DBA heat sink
- missile barrier
- safety-related equipment shelter or protection
- shielding against radiation
- pressure boundary or essentially leak-tight barrier in postulated design-basis events to protect public health and safety
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent
- satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.1 and UFSAR Sections 3.8.1 through 3.8.3, using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

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

The staff's review of LRA Section 2.4.1 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results, and determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The applicant responded to the staff's RAIs as discussed below.

In RAI 2.4.1-1, dated August 3, 2007, the staff noted LRA Table 2.4-1 lists the drywell head (the term "Drywell Head Assembly" used in the UFSAR is more appropriate) as a primary containment component type subject to an AMR. The staff was not clear from Tables 2.4-1 and 2.4-10 whether: (a) the mating flange bolts that secure the head to the lower flange; (b) the manhole bolts; and (c) the double rubber gaskets that help prevent loss of joint leak-tightness at the head-to-lower flange connection and at the manhole, are included within the scope of license renewal and subject to an AMR. The staff requested that the applicant confirm whether these components are within the scope of license renewal and if they were not included as a result of an oversight, provide a description of their scoping, screening and an AMR. If these components are excluded from the scope of license renewal, provide the technical basis for the exclusion.

In its response to RAI 2.4.1-1, dated August 28, 2007, the applicant stated:

> The mating flange bolts that secure the Drywell Head to the lower flange; the manhole bolts that secure the Manhole to the Drywell Head; and the gaskets that help prevent loss of joint leak-tightness at the Drywell Head to lower flange connection and at the manhole to Drywell Head are included in the scope of License Renewal for SSES and subject to aging management review. The manhole and gaskets are considered as part of the host component "Drywell head" and are included under Component Type "Drywell head" in Table 2.4-1. The mating flange bolts and the manhole bolts are included under Component Type "Anchor bolts (ASME Class 1, 2, 3 and MC supports bolting)" in Table 2.4-10.
>
> Table 2.4-1 specific component type and Table 3.5.2-1 specific component/commodity are revised as shown in *bold italics* in Attachment 2 (of the applicant's response letter dated August 28, 2007) to describe the component type as: Drywell head *(drywell head assembly includes manhole and double gaskets)*

Based on its review, the staff finds the applicant's response to RAI 2.4.1-1 acceptable because the applicant has clarified that the mating flange bolts, the manhole bolts and the gaskets of the drywell head assembly are included in the scope of license renewal and subject to an AMR. The applicant verified that the manhole and gaskets are considered as part of the host component "Drywell head" and are included under component type "Drywell head" in LRA Table 2.4-1. The applicant revised the drywell head component type description in LRA Tables 2.4-1 and 3.5.2-1 to read: Drywell head *(drywell head assembly includes manhole and double gaskets)*. The staff confirms that the mating flange bolts and the manhole bolts are included under component type "Anchor bolts (ASME Code Class 1, 2, 3 and MC supports bolting)" in LRA Table 2.4-10. Table 2.4-10 of the LRA has an abbreviation, among others, of "SSR" in the intended function column against the component type "Anchor bolts (ASME Code Class 1, 2, 3 and MC supports bolting)" which is intended to include components that provide structural or functional support to safety-related equipment (see LRA Table 2.0-1 for definition of intended function abbreviated as "SSR") and, therefore, include the mating flange bolts and the manhole bolts of the drywell head assembly. Therefore, the staff's concern described in RAI 4.2.1-1 is resolved.

In RAI 2.4.1-2, the staff noted LRA Table 2.4-1 lists penetrations (mechanical and electrical, primary containment boundary), as components subject to an AMR. This does not seem to include the penetrations through the reactor shield wall with hinged doors or removable plugs that facilitate piping (*i.e*., feedwater, reactor recirculation, recirculation inlet, etc.) connections to the RV which provide access for in-service inspection (see UFSAR Section 3.8.3.1.3 and drawings C-1932 Sheets 3 & 5). The staff requested that the applicant confirm whether these penetrations and their doors and/or plugs are within the scope of license renewal and subject to an AMR and if they were not included as a result of an oversight, provide a description of their scoping, screening and AMR. If they are excluded from the scope of license renewal, provide the technical basis for the exclusion.

In its response to RAI 2.4.1-2, dated August 28, 2007, the applicant stated:

> The penetrations through the Reactor Shield Wall with hinged doors or removable plugs are in the scope of License Renewal for SSES and subject to aging management review. These penetrations are included under Component Type "Penetrations (Mechanical and Electrical, non Primary Containment boundary)" in Table 2.4-10. The Reactor Shield Wall hinged doors/removable plugs are in the scope of License Renewal for SSES and subject to aging management review. These doors/plugs are included under Component Type "Reactor shield doors" in Table 2.4-1.
>
> Table 2.4-1 specific component type and Table 3.5.2-1 specific component/commodity are revised as shown in *bold italics* in Attachment 3 (of the applicant's response letter dated August 28, 2007) to describe the component type as: Reactor shield doors *(includes hinged doors and removable plugs)*

Based on its review, the staff finds the applicant's response to RAI 2.4.1-2 acceptable because the applicant has confirmed that the penetrations through the reactor shield wall are included within the scope of license renewal and subject to an AMR, and are included under the component type "Penetrations (Mechanical and Electrical, non Primary Containment boundary)" in LRA Table 2.4-10. The staff confirms that these penetrations are part of the non-primary containment boundary and appropriately belong in LRA Table 2.4-10. The applicant also verified that the reactor shield wall hinged doors and removable plugs also are within the scope of license renewal and subject to an AMR, and are included under the component type "Reactor shield doors" in LRA Table 2.4-1. The applicant revised the corresponding component type description in LRA Tables 2.4-1 and 3.5.2-1 to read: Reactor shield doors *(includes hinged doors and removable plugs)*. Therefore, the staff's concern described in RAI 2.4.1-2 resolved.

In RAI 2.4.1-3, the staff noted LRA Section 2.4.1 and Table 2.4-1 list access hatches (equipment hatch, personnel airlock, suppression chamber access hatches, and the control rod drive removal hatch) as primary containment components subject to an AMR. The staff is unclear form LRA Tables 2.4-1 and 2.4-10 whether the flange double-gaskets, hatch locks, hinges and closure mechanisms that help prevent loss of sealing and/or leak-tightness for these listed hatches are included within the scope of license renewal and subject to an AMR. The staff requested that the applicant confirm whether these components are within the scope of license renewal, and if they were not included as a result of an oversight, please provide a description of their scoping, screening and AMR. If they are excluded from the scope of license renewal, provide the technical basis for the exclusion.

In its response to RAI 2.4.1-3, dated August 28, 2007, the applicant stated:

> The Component Types "Control rod drive (CRD) removal hatch," "Personnel airlock and equipment hatches" and "Suppression chamber access hatches" in Table 2.4-1 include the flange gaskets, hatch locks, hinges and closure mechanisms. These subcomponents (flange gaskets, hatch locks, hinges and closure mechanisms) are considered as part of the host component and are in the scope of License Renewal for SSES and subject to aging management review. Under the Discussion column for LRA Table Items 3.5.1-16 and 3.5.1-17 these subcomponents are listed as part of the host component.

Based on its review, the staff finds the applicant's response to RAI 2.4.1-3 acceptable because the applicant has clarified that the flange gaskets, hatch locks, hinges and closure mechanisms are included as subcomponents considered as part of the corresponding host components (the access hatches) and are within the scope of license renewal and subject to an AMR. The applicant also clarified that in the discussion column for LRA Table 3.5.1-16 and 3.5.1-17, these subcomponents are listed as part of the host component. The staff determines that these subcomponents can be considered as part of the host components within the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.4.1-3 is resolved.

In RAI 2.4.1-4, the staff noted, based on information in LRA Section 2.4.1 and Tables 2.4-1 and 2.4-10, it is not clear whether all drywell pipe restraints and/or whip restraints are within the scope of license renewal. The staff requested that the applicant confirm whether these components are within the scope of license renewal, and if they were not included as a result of an oversight, please provide a description of their scoping, screening and AMR. If they are covered somewhere else in the LRA, please indicate the location, and if they are excluded from the scope of license renewal, provide the technical basis for the exclusion.

In its response to RAI 2.4.1-4, dated August 28, 2007, the applicant stated:

> The drywell pipe restraints/whip restraints are in the scope of License Renewal for SSES and subject to aging management review. These pipe restraints/whip restraints are included under Component Type "HELB barriers" in Table 2.4-10. HELB barriers provide jet impingement protection to various in-scope components. HELB barriers include pipe whip restraints, jet impingement shields or plate barriers, and crushable energy absorbers.
>
> Table 2.4-10 specific component type and Table 3.5.2-10 specific component/commodity are revised as shown in *bold italics* in Attachment 4 (of the applicant's response letter dated August 28, 2007) to describe the component type as: HELB barriers *(includes pipe restraints, whip*

> *restraints, jet impingement shields/plate barriers, and crushable energy absorbers)*.

Based on its review, the staff finds the applicant's response to RAI 2.4.1-4 acceptable because the applicant has clarified that the drywell pipe restraints and/or whip restraints are within the scope of license renewal and subject to an AMR. The drywell pipe restraints and/or whip restraints and are included under component type "HELB barriers" in LRA Table 2.4-10, since HELB barriers provide jet impingement protection to various in-scope components. The applicant further clarified that HELB barriers include pipe whip restraints, jet impingement shields or plate barriers, and crushable energy absorbers. The staff confirms that the applicant has appropriately revised the component type description in LRA Tables 2.4-10 and 3.5.2-10. Therefore, the staff's concern described in RAI 2.4.1-3 is resolved.

In RAI 2.4.1-5, the staff noted LRA Section 2.4.1, page 2.4-5 states that the suppression chamber vent pipe system is evaluated as a mechanical component in LRA Section 2.3.2.5. LRA Table 2.3.2-5 includes downcomers and piping and piping components as component types subject to an AMR. It is not clear whether the vent pipe support assemblies and downcomer (vent) pipe bracing system (see drawing C-1932 Sheet 4 and UFSAR Figure 6.2-56) are included within the scope of license renewal and subject to an AMR. The staff requested that the applicant whether these components are within the scope of license renewal and subject to an AMR, and if they were not included as a result of an oversight, provide a description of their scoping, screening, and AMR. If these components are excluded from the scope of license renewal, provide the technical basis for the exclusion.

In its response to RAI 2.4.1-5, dated August 28, 2007, the applicant stated:

> The suppression chamber vent pipe system supports are in the scope of License Renewal for SSES and subject to aging management review. These supports are included under Component Type "Component and piping supports (Class 1, 2, 3 and MC)" in Table 2.4-10.

Based on its review, the staff finds the applicant's response to RAI 2.4.1-5 acceptable because the applicant has verified that the vent pipe system supports are within the scope of license renewal and subject to an AMR, and are included under the component type "Component and piping supports (Class 1, 2, 3 and MC)" in LRA Table 2.4-10. The staff determines that the vent system supports are appropriately classified and described in the LRA Table 2.4-10. Therefore, the staff's concern described in RAI 2.4.1-5 is resolved.

2.4.1.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff found a certain lack of clarity, but no gross omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the primary containment SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.2 Reactor Building

2.4.2.1 Summary of Technical Information in the Application

In LRA Section 2.4.2, the applicant described the RB, a seismic Category I structure that encloses the primary containment, and provides secondary containment when the primary containment is in service during power operation and also serves as containment during reactor refueling and maintenance operations when the primary containment is open. It houses the auxiliary systems of the nuclear steam supply system, new fuel storage vaults, the refueling facility, and equipment essential to the safe reactor shutdown. The RB consists of the following major structural components: (a) foundation mat, (b) walls, (c) floors, (d) superstructure, and (e) refueling floor.

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

LRA Table 2.4.2-1 identifies RB component types within the scope of license renewal and subject to an AMR:

- blowout panels
- cranes, including bridge and trolley, rails, and girders
- exterior precast concrete panels (above grade)
- exterior walls (above grade)
- exterior walls (below grade)
- floor decking
- foundations
- fuel shipping cask storage pool gates
- fuel shipping cask storage pool liner
- masonry block walls
- metal siding
- new fuel racks
- new fuel storage vault
- new fuel storage vault watertight covers
- reactor well and steam dryer and separator storage pool gates
- reactor well and steam dryer and separator storage pool liners
- reactor well shield plugs
- reinforced concrete: walls, floors, and ceilings
- roof decking
- spent fuel pool gates
- spent fuel pool liners
- spent fuel pool racks
- spent fuel rack neutron absorbers
- structural steel: beams, columns, plates, and trusses
- sump liners
- sumps

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

- thermal expansion, seismic separation, or both
- rated fire barrier to confine or retard fire spread in adjacent plant areas
- flood protection barrier
- shielding against high-energy line breaks
- missile barrier
- pipe whip restraint
- safety-related equipment shelter or protection
- shielding against radiation
- pressure boundary or essentially leak-tight barrier in postulated design-basis events to protect public health and safety
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2 and UFSAR Section 3.8.4 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 SCs with intended functions, pursuant to 10 CFR 54.4(a). The staff then reviewed those SCs that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived SCs subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

During its review of the LRA Section 2.4.2, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for structures. Therefore, the staff issued RAIs concerning the specific issues, to determine whether the applicant properly applied the scoping criteria pursuant to 10 CFR 54.4(a) and the screening criteria in accordance with 10 CFR 54.21(a)(1). The following discussion describes the staff's RAIs related to LRA Section 2.4.2 and the corresponding applicant responses.

In RAI 2.4.2-1, dated August 3, 2007, the staff noted LRA Table 2.4-2 lists "Reinforced concrete: walls, floors, and ceilings," within the RB, as a component type subject to an AMR. The staff requested that the applicant confirm whether the two reinforced concrete girders (see last paragraph of UFSAR page 3.8-41) supporting the refueling facility within the Reactor Building are within the scope of license renewal and subject to an AMR and; if so, revise the LRA table, accordingly. If they are not within the scope of license renewal, provide the technical basis for the exclusion.

In its response to RAI 2.4.2-1, dated August 28, 2007, the applicant stated:

> The two reinforced concrete girders that support the refueling facility within the Reactor Building are in the scope of License Renewal for SSES and subject to aging management review. They are considered floor beams/walls for the refueling pools and are integral to the Reactor Building concrete structure. The reinforced concrete girders are included under Component Type "Reinforced concrete: walls, floors, and ceilings" in Table 2.4-2.
>
> Table 2.4-2 specific component type and Table 3.5.2-2 specific component/commodity are revised as shown in *bold italics* in Attachment 5 (of the applicant's response letter dated August 28, 2007) to describe the component type as:
>
> Reinforced concrete: *girders*, walls, floors, and ceilings

Based on its review, the staff finds the applicant's response to RAI 2.4.2-1 acceptable because the applicant has verified that the two reinforced concrete girders supporting the refueling floor girders facility within the RB are within the scope of license renewal and subject to an AMR. The applicant further verified that these components are integral to the RB concrete structure and are included under component type "Reinforced concrete: walls, floors, and ceilings" in the LRA Table 2.4-2. The staff confirms that the applicant has revised the component type description in LRA Tables 2.4-2 and 3.5.2-2 to read as: "Reinforced concrete: *girders,* walls, floors, and ceilings." Therefore, the staff's concern described in RAI 2.4.2-1 is resolved.

In RAI 2.4.2-2, dated August 3, 2008, the staff noted LRA Table 2.4-2 lists "Reactor well shield plugs," within the RB, as a component type subject to an AMR. It was not clear to the staff whether the spent fuel pool plugs and dryer/separator pool plugs (see drawing C-1932 Sheet 5) are included within the scope of license renewal. The staff requested that the applicant confirm that these components are within the scope of license renewal and subject to an AMR and; if so, revise the LTA table, accordingly. If they are not within the scope of license renewal, provide the technical basis for the exclusion.

In its response to RAI 2.4.2-2, dated August 28, 2007, the applicant stated:

> The plugs that separate the Reactor Well and the Spent Fuel Storage Pool and the plugs that separate the Reactor Well and the Steam Dryer and Separator Storage Pool are in the scope of License Renewal for SSES and subject to aging management review. These plugs are included under Component Types "Spent fuel pool gates" and "Reactor well and steam dryer and separator storage pool gates" in Table 2.4-2. These slot plugs are concrete enclosed in welded stainless steel.
>
> Table 2.4-2 specific component type and Table 3.5.2-2 specific component/commodity are revised as shown in *bold italics* in Attachment 6 (of the applicant's response letter dated August 28, 2007) to describe the component types as:
>
> Reactor well and steam dryer and separator storage pool gates *(includes*

steam dryer / separator pool plugs" and "Spent fuel pool gates *(includes spent fuel pool plugs)*

Based on its review, the staff finds applicant's response to RAI 2.4.2-2 acceptable because the applicant has verified that the plugs that separate the reactor well and the spent fuel storage pool and the plugs that separate the reactor well and the steam dryer and separator storage pool are within the scope of license renewal and subject to an AMR. The applicant further verified that these plugs are included under component types "Spent fuel pool gates" and "Reactor well and steam dryer and separator storage pool gates" in the LRA Table 2.4-2. The staff confirms that the applicant has appropriately revised the component type descriptions in LRA Table 2.4-2 to include these plugs. Therefore, the staff's concern described in RAI 2.4.2-2 is resolved.

In RAI 2.4.2-3, dated August 3, 2008, the staff noted LRA Tables 2.4-2, 2.4-4, 2.4-6, 2.4-7, and 2.4-8, list "Cranes, including bridge and trolley, rails, and girders," within the respective structures, as a component type subject to an AMR. It is not clear to the staff which cranes have been included within the scope of license renewal and whether all relevant subcomponents ("...including bridge and trolley, rails, and girders") have been screened as items subject to an AMR. The staff requested that the applicant (a) identify the specific cranes in each of these structures that are included within the above component type as within the scope of license renewal and subject to an AMR and those that are excluded and; if excluded, provide the technical basis for the exclusion; (b) confirm whether fasteners and rail hardware associated with this component type are within the scope of license renewal and subject to an AMR and; if not, provide the technical basis for the exclusion and; (c) verify whether there are any other hoists and lifting devices (*e.g*. reactor coolant pump lifting slings, lifting rigs, etc.) that should be included within the scope of license renewal and subject to an AMR and; if so, include these components in the LRA tables and provide the associated scoping, screening and an AMR results.

In its response to RAI 2.4.2-3, dated August 28, 2007, the applicant stated:

> For SSES all material handling equipment specified in the response to NUREG-0612, Control of Heavy Loads, is in the scope of License Renewal for SSES and subject to an AMR. (Refer to SSES Unit 1 Control of Heavy Loads - Phase 1 - Safety Evaluation Report from NRC to PPL (August 2, 1983) and SSES Unit 2 Control of Heavy Loads - Phase 1 - Safety Evaluation Report from NRC to PPL (November 22, 1983). In addition, other monorails, hoists and miscellaneous cranes within License Renewal in-scope structures are also in the scope of License Renewal for SSES and subject to an AMR. Relevant subcomponents ("...including bridge and trolley, rails, and girders") are in the scope of License Renewal for SSES and subject to an AMR. These subcomponents are included under Component Type "Cranes, including bridge and trolley, rails, and girders" in Tables 2.4-2, 2.4-4, 2.4-6, 2.4-7, and 2.4-8.
>
> Fasteners and rail hardware associated are in the scope of License Renewal for SSES and subject to an AMR. These fasteners and rail hardware included under Component Type "Anchorage / Embedments and Anchor Bolts" in Table 2.4-10.

Lifting devices (e.g. lifting slings, lifting rigs, etc.) are tools/rigging that are not within License Renewal scope at SSES.

All the cranes, monorails, hoists and miscellaneous cranes within the in-scope License Renewal SSES structures are in the scope of License Renewal for SSES and subject to an AMR.

The following is a list of License Renewal in-scope Cranes, Monorails, Hoists and Miscellaneous Cranes for SSES.

SSES Cranes and Monorails, Hoists (NUREG-0612)	
Building	**Description**
Reactor	Reactor Building Crane
Reactor	Refueling Platform
Diesel GeneratorA to E	Diesel Generator Bridge Cranes
Monorails, Hoists and Miscellaneous Cranes	
Reactor	Recirculation Pump Hoist
Reactor	RHR Heat Exchanger Hoists
Reactor	HPCI Hoist
Reactor	Core Spray Pump & Cooling Water Heat Exchanger Hoists
Reactor	Equipment Shaft Crane
Reactor	Reactor Building Concrete Shielding Block Hoists
Reactor	Drywell Equipment Hatch Hoist
Primary Containment	Drywell Main Steam Relief Valve Hoist
Primary Containment	Main Steam Isolation Valve Hoist
SSES Monorails, Hoists and Miscellaneous Cranes (Not within NUREG-0612)	
Building	**Description**
Circulating Water Pumphouse	Circulating Water Pump Bridge Crane
Turbine	220 Ton Overhead Cranes
Various in-scope structures	Miscellaneous monorails/hoists within in-scope structures

Based on its review, the staff finds the applicant's response to RAI 2.4.2-3 acceptable because the applicant has verified that all material handling equipment specified in the response to NUREG-0612, "Control of Heavy Loads," is within the scope of license renewal and subject to an AMR. In addition, other monorails, hoists and miscellaneous cranes within in-scope structures are also within the scope of license renewal and subject to an AMR. The applicant also verified that:

- Relevant subcomponents ("...including bridge and trolley, rails, and girders") are within the scope of license renewal and subject to an AMR, and are included under component type “Cranes, including bridge and trolley, rails, and girders” in LRA Tables 2.4-2, 2.4-4, 2.4-6, 2.4-7, and 2.4-8.

- All the cranes, monorails, hoists and miscellaneous cranes within the in-scope structures are within the scope of license renewal and subject to an AMR and are tabulated in a comprehensive list of in-scope cranes, monorails, hoists and miscellaneous cranes for SSES.
- Fasteners and rail hardware associated are within the scope of license renewal and subject to an AMR, and are included under component type “Anchorage / Embedments and Anchor Bolts” in LRA Table 2.4-10.
- Lifting devices (e.g. lifting slings, lifting rigs, etc.) are tools/rigging and not within the scope of license renewal.

The staff confirms that lifting devices such as slings and rigs are not within the scope of license renewal, since they are tools/rigging and do not serve an intended function pursuant to 10 CFR 54.4(a), are not passive nor long-lived, and are routinely inspected and replaced as needed. The staff finds that the applicant has appropriately applied the scoping criteria pursuant to 10 CFR 54.4(a) and screening criteria in accordance with 10 CFR 54.21(a)(1) and has identified all the cranes and associated subcomponents that are within the scope of license renewal and subject to an AMR. Therefore, the staffs concerns described in RAI 2.4.2-3 are resolved.

2.4.2.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff found a certain lack of clarity, but no gross omissions. In addition, the staff’s review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RB SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable. The staff notes that RAI 2.4.2-3, the applicant’s response, and the staff’s evaluation of the response also apply to the staff’s evaluation of LRA sections 2.4.2, 2.4.4, 2.4.6, 2.4.7, and 2.4.8.

2.4.3 Engineered Safeguards Service Water Pumphouse and Spray Pond

2.4.3.1 Summary of Technical Information in the Application

In LRA Section 2.4.3, the applicant described the ES SW pumphouse and spray pond, both seismic Category I structures. The ES SW pumphouse contains the ESW and RHRSW pumps and the weir and discharge conduit for the spray pond. It is a two-story reinforced concrete structure on a mat foundation. The first level of the structure is below grade with the following major compartments: (a) pump intake chambers, (b) overflow weir, and (c) discharge header compartments. Pumps, valving, and electrical switchgear are in the second level of the structure at grade. HVAC equipment is located on a steel-framed mezzanine level. A mezzanine floor supports the heating and ventilating equipment. The ES SW pumphouse consists of the following major structural components: (a) foundation mat, (b) floors, (c) roof, (d) walls, and (e) chambers.

The spray pond (ultimate heat sink) provides cooling water to support operation of the ESW and RHRSW systems during system testing, normal shutdown, and accident conditions. The ultimate heat sink can provide sufficient cooling water without makeup to the spray pond for at least 30 days, to permit simultaneous safe-shutdown and cool-down of both reactor units and can maintain them in a safe-shutdown condition. The spray pond can provide enough cooling water without makeup for a design-basis LOCA in one unit with the simultaneous shutdown of the other for 30 days, assuming a concurrent safe-shutdown earthquake, single failure, and loss of offsite power. The spray pond consists of the following major structural components: (a) spray pond liner, (b) spillway, (c) spray system, and (d) earthen embankment. The ES SW pumphouse and spray pond contain safety-related components relied upon to remain functional during and following DBEs. In addition, the ES SW pumphouse and spray pond perform functions that support fire protection, ATWS, and SBO.

LRA Table 2.4.3-1 identifies ES SW pumphouse and spray pond component types within the scope of license renewal and subject to an AMR:

- bulkhead closure plates
- bulkhead fixed screens
- bulkhead screen guides
- earthen embankment
- exterior walls (above grade)
- exterior walls (below grade)
- foundations
- overflow weir and chamber
- pump intake chambers
- reinforced concrete: walls, floors, and ceilings
- roof and floor decking
- roof slabs
- spray pond emergency spillway
- spray pond liner
- spray pond riser concrete encasements
- structural steel: beams, columns, plates, and trusses
- trash racks
- sumps

The intended functions of the ES SW pumphouse and spray pond component types within the scope of license renewal include:

- rated fire barrier to confine or retard fire spread in adjacent plant areas
- flood protection barrier
- SBO or DBA heat sink
- missile barrier
- safety-related equipment shelter or protection
- plant shutdown cooling water source
- structural or functional support to safety-related components

- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.3 and UFSAR Sections 3.8.4 and 9.2.7 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

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

2.4.3.3 Conclusion

The staff reviewed the LRA, UFSAR, 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ES SW pumphouse and spray pond SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.4 Circulating Water Pumphouse and Water Treatment Building

2.4.4.1 Summary of Technical Information in the Application

In LRA Section 2.4.4, the applicant described the CWPH and water treatment building, which is not a seismic Category I structure. The water treatment building is attached to the CWPH, which contains electric and diesel-driven fire-water pumps separated by a structural fire barrier. The water treatment building contains no equipment within the scope of license renewal but shares with the CWPH a common wall, foundation, and roof, the structural components of which are within the scope of license renewal, but not the remainder of the water treatment building. The CWPH and water treatment building consist of the following major structural components: (a) foundation mat, (b) floors, (c) walls, and (d) roof.

The CWPH and water treatment building perform functions that support fire protection.

LRA Table 2.4.4-1 identifies CWPH and water treatment building component types within the scope of license renewal and subject to an AMR:

- battery racks
- cranes, including bridge and trolley, rails, and girders
- exterior precast concrete panels (above grade)
- exterior walls (above grade)

- exterior walls (below grade)
- floor decking
- foundations
- masonry block walls
- metal siding
- reinforced concrete: walls, floors, and ceilings
- roof decking
- structural steel: beams, columns, plates, and trusses
- sumps

The intended functions of the CWPH and water treatment building component types within the scope of license renewal include:

- rated fire barrier to confine or retard fire spread in adjacent plant areas
- flood protection barrier
- safety-related equipment shelter or protection
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

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

The staff notes that RAI 2.4.2-3, the applicant's response and staff evaluation in LRA Section 2.4.2 (regarding the "cranes" component type) also applies to this LRA Section 2.4.4.

2.4.4.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff found a certain lack of clarity but no gross omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CWPH and water treatment building SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.5 Control Structure

2.4.5.1 Summary of Technical Information in the Application

In LRA Section 2.4.5, described the control structure, a seismic Category I structure that houses the control room, the cable spreading rooms, computer and relay room, the battery room, heating and ventilation equipment room, off-gas treatment room, and the control room visitors' gallery. The control structure consists of the following major structural components: (a) foundation mat, (b) walls, (c) floors and roof, and (d) power generation control complex. The control structure contains safety-related components relied upon to remain functional during and following DBEs. In addition, the control structure performs functions that support fire protection, ATWS, and SBO.

LRA Table 2.4.5-1 identifies control structure component types within the scope of license renewal and subject to an AMR:

- battery racks
- control room ceiling
- exterior walls (above grade)
- exterior walls (below grade)
- floor decking
- foundations
- masonry block walls
- power generation control complex flooring
- reinforced concrete: walls, floors, and ceilings
- roof slabs
- structural steel: beams, columns, plates, and trusses

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

- thermal expansion, seismic separation, or both
- rated fire barrier to confine or retard fire spread in adjacent plant areas
- flood protection barrier
- filtered and unfiltered gaseous discharge release path
- missile barrier
- safety-related equipment shelter or protection
- shielding against radiation
- pressure boundary or essentially leak-tight barrier in postulated design-basis events to protect public health and safety
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.4.5 and UFSAR Section 3.8.4 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 SCs with intended functions, pursuant to 10 CFR 54.4(a). The staff then reviewed those SCs that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived SCs subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.5.3 Conclusion

The staff reviewed the LRA, UFSAR, 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the control structure SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.6 Diesel Generator A, B, C, and D Building

2.4.6.1 Summary of Technical Information in the Application

In LRA Section 2.4.6, the applicant described the DG A, B, C, and D building, a seismic Category I structure housing DGs A, B, C, and D, which are essential for safe shutdown of the plant. The DGs are separated from each other by concrete walls. A concrete overhang on the east side of the building serves as an air intake plenum. A concrete plenum for diesel exhaust is on the roof. The DG A, B, C and D building consists of the following major structural components: (a) foundation mat, (b) walls, and (c) floors and roof.

The DG A, B, C, and D building contains safety-related components relied upon to remain functional during and following DBEs. In addition, the building performs functions that support fire protection and SBO.

LRA Table 2.4.6-1 identifies DG A, B, C, and D building component types within the scope of license renewal and subject to an AMR:

- cranes, including bridge and trolley, rails, and girders
- diesel generator exhaust plenums
- diesel generator intake plenums
- exterior precast concrete panels (above grade)
- exterior walls (above grade)
- exterior walls (below grade)
- floor decking

- foundations
- masonry block walls
- metal siding
- reinforced concrete: walls, floors, and ceilings
- roof slabs
- structural steel: beams, columns, plates, and trusses
- sumps

The intended functions of the DG A, B, C, and D building component types within the scope of license renewal include:

- thermal expansion, seismic separation, or both
- rated fire barrier to confine or retard fire spread in adjacent plant areas
- flood protection barrier
- missile barrier
- safety-related equipment shelter or protection
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.6.2 Staff Evaluation

The staff reviewed LRA Section 2.4.6 and UFSAR Section 3.8.4 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 SCs with intended functions, pursuant to 10 CFR 54.4(a). The staff then reviewed those SCs that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived SCs subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

During its review of the LRA Sections 2.4.6 and 2.4.7, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for structures. Therefore, the staff issued concerning the specific issues, to determine whether the applicant properly applied the scoping criteria pursuant to 10 CFR 54.4(a) and the screening criteria in accordance with 10 CFR 54.21(a)(1). The following discussion describes the staff's RAIs related to the LRA Sections 2.4.6 and 2.4.7 and the corresponding applicant responses.

The staff notes that RAI 2.4.2-3, the applicant's response and staff evaluation in LRA Section 2.4.2 (regarding the "cranes" component type) also applies to this LRA Section 2.4.6.

In RAI 2.4.6-1, dated August 3, 2007, the staff noted LRA Tables 2.4-6 and 2.4-7 list the components of the DG A, B, C, D, and E buildings that are subject to an AMR. The staff requested that the applicant confirm that the DG pedestals are components requiring an AMR and are included in the referenced LRA tables and; if not, provide the technical basis for the exclusion.

In its response to RAI 2.4.6-1, dated August 28, 2007, the applicant stated:

> Diesel Generator Pedestals are an integral part of the Diesel Generator building concrete structure and are in the scope of License Renewal for SSES and subject to aging management review. The Diesel Generator Pedestals are included under Component Type “Reinforced concrete: walls, floors, and ceilings” in Table 2.4-6 and Table 2.4-7.

Based on its review, the staff finds the applicant’s response to RAI 2.4.6-1 acceptable because the applicant has verified that the DG pedestals are an integral part of the DG building concrete structure, within the scope of license renewal, subject to an AMR, and included under component type “Reinforced concrete: walls, floors, and ceilings” in LRA Tables 2.4-6 and 2.4-7. Since the pedestals are an integral part of the DG building concrete floor, staff finds that the applicant has appropriately included the DG pedestals under the component type “Reinforced concrete: walls, floors, and ceilings.” Therefore, the staff’s concern described in RAI 2.4.6-1 is resolved. The staff notes that RAI 2.4.6-1, the applicant’s response, and the above staff evaluation also applies to the LRA Section 2.4.7.

2.4.6.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff found a certain lack of clarity but no gross omissions. In addition, the staff’s review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the DG A, B, C, and D building SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.7 Diesel Generator E Building

2.4.7.1 Summary of Technical Information in the Application

In LRA Section 2.4.7, the applicant described the DG E building, a seismic Category I structure that houses DG E, which replaces one of the A, B, C, and D DGs. Openings for air intake and diesel exhaust are flush with the north and south exterior walls, respectively. Interior plenums are for missile protection. The DG E building consists of the following major structural components: (a) foundation mat, (b) walls, and (c) floors and roof.

The DG E building contains safety-related components relied upon to remain functional during and following DBEs. In addition, the DG E building performs functions that support fire protection and SBO.

LRA Table 2.4.7-1 identifies DG E building component types within the scope of license renewal and subject to an AMR:

- battery racks
- cranes, including bridge and trolley, rails, and girders
- diesel generator exhaust plenums
- diesel generator intake plenums
- exterior walls (above grade)
- exterior walls (below grade)
- foundations
- metal siding
- reinforced concrete: walls, floors, and ceilings
- roof slabs
- sumps

The intended functions of the DG E building component types within the scope of license renewal include:

- rated fire barrier to confine or retard fire spread in adjacent plant areas
- flood protection barrier
- missile barrier
- safety-related equipment shelter or protection
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.7.2 Staff Evaluation

The staff reviewed LRA Section 2.4.7 and UFSAR Section 3.8.4 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 SCs with intended functions, pursuant to 10 CFR 54.4(a). The staff then reviewed those SCs that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived SCs subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff notes that RAI 2.4.2-3, applicant’s response, and the staff evaluation in LRA Section 2.4.2 (regarding the “cranes” component type) also applies to LRA Section 2.4.7.

The staff also notes that RAI 2.4.6-1 (regarding DG pedestals), the applicant’s response, and the staff evaluation of the same in LRA Section 2.4.6 applies to LRA Section 2.4.7.

2.4.7.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal.

The staff found a certain lack of clarity but no gross omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the DG E building SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.8 Turbine Building

2.4.8.1 Summary of Technical Information in the Application

In LRA Section 2.4.8, the applicant described the TB, not a seismic Category I structure, which is divided into two units with an expansion joint separating them. It houses two in-line turbine generator units and the following auxiliary equipment: condensers, condensate pumps, moisture separators, air ejectors, feedwater heaters, reactor feed pumps, motor generator sets for reactor recirculation pumps, recombiners, interconnecting piping and valves, and switchgears. (Note: The basement elevation (656 feet) of the TB is an area accessed through the TB; with walls, floor, and foundation belonging to the control structure, but not part of the control structure pressurization envelope.) The TB consists of the following major structural components: (a) foundation mat, (b) walls, (c) floors and roof, (d) MS tunnel, and (e) turbine generator pedestals

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

LRA Table 2.4.8-1 identifies TB component types within the scope of license renewal and subject to an AMR:

- blowout panels
- cranes, including bridge and trolley, rails, and girders
- exterior precast concrete panels (above grade)
- exterior walls (above grade)
- exterior walls (below grade)
- floor decking
- foundations
- main steam tunnels
- masonry block walls
- metal siding
- reinforced concrete: walls, floors, and ceilings
- roof decking
- shield plugs
- structural steel: beams, columns, plates, and trusses
- sump liners
- sumps
- turbine generator pedestals
- turbine generator pedestal structural bearing pads

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

- thermal expansion, seismic separation, or both

- rated fire barrier to confine or retard fire spread in adjacent plant areas
- flood protection barrier
- missile barrier
- safety-related equipment shelter or protection
- shielding against radiation
- pressure boundary or essentially leak-tight barrier in postulated design-basis events to protect public health and safety
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.8.2 Staff Evaluation

The staff reviewed LRA Section 2.4.8 and UFSAR Section 3.8.4 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 SCs with intended functions, pursuant to 10 CFR 54.4(a). The staff then reviewed those SCs that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived SCs subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

During its review of the LRA Sections 2.4.8, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for structures. Therefore, the staff issued RAIs concerning the specific issues, to determine whether the applicant properly applied the scoping criteria pursuant to 10 CFR 54.4(a) and the screening criteria in accordance with 10 CFR 54.21(a)(1). The following discussion describes the staff's RAIs related to the LRA Section 2.4.8 and the corresponding applicant responses.

The staff notes that RAI 2.4.2-3, applicant response, and the staff evaluation in LRA Section 2.4.2 (regarding the "cranes" component type) also applies to LRA Section 2.4.6.

In RAI 2.4.8-1, dated August 3, 2007, the staff noted LRA Table 2.4-8 lists the components of the TB that are subject to an AMR. the staff requested that the applicant confirm whether the pipe tunnels at the foundation level for the off-gas piping (see third paragraph under the title "Turbine Building" on page 3.8-44 of the UFSAR and drawing A-11 Sheet 1) are within the scope of license renewal, subject to an AMR, and included in the referenced LRA table, and; if not, provide the technical basis for the exclusion.

In its response to RAI 2.4.8-1, dated August 28, 2007, the applicant stated:

> The pipe tunnels at the foundation level for the off-gas piping are an integral part of the Turbine building concrete structure and in the scope of

License Renewal for SSES and subject to aging management review. The pipe tunnels are included under Component Type "Reinforced concrete: walls, floors, and ceilings" in Table 2.4-8.

Based on its review, the staff finds the applicant's response to RAI 2.4.8-1 acceptable because the applicant has verified that the pipe tunnels at the foundation level for the off-gas piping are an integral part of the TB concrete structure, within the scope of license renewal, and subject to an AMR. The staff confirms that the applicant has included these pipe tunnels under component type "Reinforced concrete: walls, floors, and ceilings" in LRA Table 2.4-8. Therefore, the staff's concern described in RAI 2.4.8-1 is resolved.

2.4.8.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff found a certain lack of clarity but no gross omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the TB SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.9 Yard Structures

2.4.9.1 Summary of Technical Information in the Application

LRA Section 2.4.9.1 describes the yard structures, which include:

- clarified water storage tank foundation
- condensate storage tank foundation and retention basin
- DG fuel oil storage tank A, B, C, D, and E foundations and vaults
- refueling water storage tank foundation
- SBO component foundations and structures in the yard (startup transformers T-10 and T-20 and associated disconnect switches, engineered safeguards systems transformers, and transmission towers)
- cooling tower basins
- duct banks, manholes, valve vaults, instrument pits, and piping trenches in the yard

The clarified water storage tank foundation is not a seismic Category I structure. The 500,000-gallon clarified water storage tank in the yard is the primary water source for fire protection with a standpipe in the tank which reserves 300,000 gallons of the stored water for fire protection. The tank is also a source of domestic water to the plant site. The clarified water storage tank foundation is a reinforced concrete slab that supports the tank bottom resting on an oiled sand pad.

The condensate storage tank foundation and retention basin are not seismic Category I structures. The condensate storage tanks are the preferred water sources for the HPCI and

RCIC pumps for both operating and testing and they supply water to the core spray pumps for testing. Each condensate storage tank maintains a minimum storage of 135,000 gallons to serve HPCI and RCIC pumps during plant operation by standpipes and locked closed valves on all other lines. The condensate storage tank foundation supporting the tank is a reinforced concrete slab approximately 3 feet thick. Waterstops are in construction joints abutting the retention basin slab. The condensate storage tank bottom rests on an oiled sand pad.

The DG fuel oil storage tank A, B, C, D, and E foundations and vaults are seismic Category I structures. There are four 50,000-gallon nominal capacity fuel oil storage tanks for DGs A, B, C and D and one 80,000-gallon nominal capacity fuel oil storage tank for DG E. The DG A, B, C, and D tanks are underground adjacent to the DG building. The DG E tank is underground adjacent to the DG E building. Diesel generator fuel oil storage tanks A, B, C and D share a common reinforced concrete slab foundation. Diesel generator fuel oil storage tank E has its own reinforced concrete slab foundation. The concrete tank foundation slab for DG fuel oil storage tanks A, B, C and D is approximately 2 feet 6 inches thick. The concrete tank foundation slab for DG fuel oil storage tank E is approximately 5 feet thick. Each tank has a concrete vault from grade to tank connection for access, maintenance, inspection, repair, and missile protection of the connection. The vault cover at grade level is steel plate.

The refueling water storage tank foundation is a not a seismic Category I structure. One 680,000-gallon refueling water storage tank common to both units stores the water that fills the reactor well and dryer separator pool of either Unit 1 or 2. The refueling water storage tank foundation supporting the tank is a reinforced concrete slab approximately 3 feet thick. Waterstops are in construction joints abutting the retention basin slab. The refueling water storage tank bottom rests on an oiled sand pad.

The SBO component foundations and structures in the yard (startup transformers T-10 and T-20, disconnect switches, engineered safeguards systems transformers, and transmission towers) are not seismic Category I structures. Startup transformers T-10 and T-20, associated disconnect switches (motor-operated Air Break Switches 1R105 and 2R105) and transmission towers provide an offsite alternating current source for recovery from an SBO regulated event. The startup transformers and disconnect switches, as well as the engineered safeguards systems transformers, are supported by reinforced concrete pads. The disconnect switches are supported by steel frame structures and the transmission conductors are supported by tapered steel transmission towers and related foundations.

The cooling tower basins are not seismic Category I structures. The basins are designed to be completely watertight with a capacity of six million gallons of water. Secondary sources of water for the plant's two main automatic fire pumps, the two cooling tower basins have a minimum depth of 7 feet 6 inches and the top of each is approximately 2 feet above the finished grade. The cooling tower basins are constructed of reinforced concrete. Their foundations are situated on bedrock.

Duct banks, manholes, valve vaults (including the spray pond valve vault), instrument pits, and piping trenches are routed in the yard for physical support and shelter for in-scope mechanical components (*e.g.*, piping and valves) and in-scope electrical components (*e.g.*, electric cables and conduits). The duct banks, manholes, valve vaults, instrument pits, and piping trenches are seismic Category I when they support or contain safety-related equipment, but not equipment required for regulated events.

The T-10 230kV switchyard and the SSES 230kV switchyard SBO component foundations and structures are located outside the security fence. The dead end structure and breakers (2S and 2T) support supplying power from the T-10 230kV switchyard to the 13.8kV bus 10 providing offsite AC sources for recovery from an SBO. The dead end structure and breakers (2T and 2W) support supplying power from the 230kV switchyard to the 13.8kV bus 20 providing offsite AC sources for recovery from an SBO. The dead end structures and breakers (2S & 2T and 2T & 2 W) are supported by reinforced concrete foundations. The control cubicles support/protect the circuitry and controls.

The 500kV switchyard SBO component foundations and structures are located outside the security fence. The 230kV dead end structure, the 230kV capacitive-coupled voltage transformer and line trap, the 230kV switch, the 230kV current transformer, and the 230kV breaker and control cubicle support supplying power from the 500kV switchyard to the 13.8kV bus 20 providing offsite AC sources for recovery from an SBO. The 230kV dead end structure, 230kV capacitive-coupled voltage transformer and line trap, 230kV switch, 230kV current transformer, and 230kV breaker are supported by reinforced concrete foundations and/or steel piles.

The yard structures contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the SSCs in the yard structure potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the yard structures perform functions that support fire protection, ATWS, and SBO. The yard structures also include structural components located outside the security fence that are associated with SBO offsite power recovery pursuant to the guidance in the SRP-LR.

LRA Table 2.4.9 identifies yard structures component types within the scope of license renewal and subject to an AMR:

- Battery racks (SBO)
- condensate storage tank retention basins
- cooling tower basic outlet screen guides
- cooling tower basin outlet screens
- cooling tower basin outlet structures
- cooling tower basins
- diesel generator fuel oil tank foundations
- diesel generator fuel oil tank vaults
- disconnect switch/capacitive-coupled voltage transformer and line trap/switch/current transformer/breaker support structures (SBO)
- duct banks
- manhole covers
- manholes
- masonry block walls (SBO)
- metal siding (SBO)

- outdoor tank foundations: condensate storage tank, clarified water storage tank, refueling water storage tank
- piles (500 kV switchyard) (SBO)
- piping trenches
- raised flooring (includes support system (SBO)
- roof decking
- reinforced concrete (floors) (SBO)
- structural steel: beams, columns, plates, and trusses (includes welds and bolt connections) (SBO)
- transformer/disconnect switch/capacitive-coupled voltage transformer and line trap/switch/current transformer/breaker/control cubicle foundations (SBO)
- transmission towers and dead end structures (SBO)
- trenches (SBO cables)
- valve vault and instrument pit hatches
- valve vaults and instrument pits

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

- flood protection barrier
- missile barrier
- safety-related equipment shelter or protection
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.9.2 Staff Evaluation

The staff reviewed LRA Section 2.4.9, revised LRA Section 2.4.9 from SBO Scope Addition PLA-6362 dated May 7, 2008, revised LRA Section 2.4.9 from SBO Scope Addition PLA-6413 dated August 29, 2008, and UFSAR Sections 9.2.8.2, 9.2.10, and 9.5.4, 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 SCs with intended functions, pursuant to 10 CFR 54.4(a). The staff then reviewed those SCs that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived SCs subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.9.3 Conclusion

The staff reviewed the LRA, LRA SBO Scope Addition PLA-6362, LRA SBO Scope Addition PLA-6413, UFSAR, 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the yard structures SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.4.10 Bulk Commodities

2.4.10.1 Summary of Technical Information in the Application

In LRA Section 2.4.10, the applicant described the bulk commodities, structural component groups that support in-scope structures and mechanical/electrical systems (*e.g.*, anchorages, embedments, instrument panels, racks, cable trays, conduits, fire seals, fire doors, hatches, monorails, equipment and component supports) for multiple SSCs, and share material and environment properties which allow a common program or inspection to manage their aging effects.

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

LRA Table 2.4.10-1 identifies bulk commodities component types within the scope of license renewal and subject to an AMR:

- concrete components
- elastomeric components
- fire barrier commodities
- insulating materials
- steel and other metals
- threaded fasteners

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

- thermal expansion, seismic separation, or both
- rated fire barrier to confine or retard fire spread in adjacent plant are

  flood protection barrier
- shielding against high-energy line breaks
- heat transfer reduction
- moisture absorption prevention and thermal insulation physical support

- missile barrier
- safety-related equipment shelter or protection
- shielding against radiation
- pressure boundary or essentially leak-tight barrier in postulated design-basis events to protect public health and safety
- structural or functional support to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural or functional support required for any of the 10 CFR 54.4(a)(3) regulated events

2.4.10.2 Staff Evaluation

The staff reviewed LRA Section 2.4.10 and the UFSAR using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

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

During its review of LRA Sections 2.4.10, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for structures. Therefore, the staff issued RAIs concerning the specific issues, to determine whether the applicant properly applied the scoping criteria, pursuant to 10 CFR 54.4(a) and the screening, in accordance with 10 CFR 54.21(a)(1). The following discussion describes the staff's RAIs related to LRA Section 2.4.10 and the corresponding applicant responses.

In RAI 2.4.10-1, dated August 3, 2007, the staff noted Sections 2.4.1 thru 2.4.9 state that the structural commodities for these respective structures are addressed in the bulk commodities evaluation in LRA Section 2.4.10. LRA Table 2.4-10 lists the bulk commodities components subject to an AMR in categories based on the material of the component type. This LRA table does not identify the specific structures addressed in LRA Sections 2.4.1 thru 2.4.9 in which these individual component types are located. The staff requested that the applicant add a column to LRA Table 2.4-10 listing the structure(s) in which each bulk commodity component type is located, and clearly state whether the intent of the LRA table is identify every occurrence (all inclusive) for which these component types, in each of the applicable structures, are within the scope of license renewal and subject to an AMR. In addition, the staff requested that the applicant specifically identify those component types which are within the scope of license renewal and subject to an AMR and those that are not and; if excluded, provide technical justification for the exclusion. Also, the staff requested that the applicant confirm and address whether or not there are any Lubrite sliding support bearings and/or surfaces within the scope of license renewal and subject to an AMR, and whether these components will be included in LRA

Table 2.4-10.

In its response to RAI 2.4.10-1, dated August 28, 2007, the applicant stated:

> As stated in Section 2.4.10, the Bulk Commodities common to SSES in-scope License Renewal structures are listed in Table 2.4-10. They are common to multiple SSCs and share material and environment properties which allow a common program or inspection to manage their aging effects. Commodities unique to a specific structure are included in the review of that structure (Sections 2.4.1 through 2.4.9). All commodities within the SSES in-scope License renewal structures are in-scope and are subject to aging management review and are listed in Table 2.4-10. Commodities classified as Bulk Commodities typically have no unique component identification number. Therefore, a comprehensive listing of components and location is not feasible. LRA Table 3.5.2-10 describes and indicates Aging Management Programs for the components listed in Section 2.4.10.
>
> There are no in-scope License Renewal Lubrite sliding support bearings/surfaces at SSES.

Based on its review, the staff finds the applicant's response to RAI 2.4.10-1 acceptable because the applicant has verified that the bulk commodities common to in-scope license renewal structures are listed in LRA Table 2.4-10, are common to multiple SSCs, and share material and environment properties which allow a common program or inspection to manage their aging effects. The applicant also verified that commodities unique to a specific structure are included in the review of that structure (LRA Sections 2.4.1 through 2.4.9); and that all commodities not unique to a specific structure are within the scope of license renewal, subject to an AMR, and listed in LRA Table 2.4-10. The applicant stated that a comprehensive listing of components and location is not feasible, since these commodities have no unique component identification number. Since the applicant basically stated that the commodities listed in LRA Table 2.4-10 include "all" bulk commodities in the in-scope structures that are not uniquely identified in LRA Sections 2.4.1 through 2.4.9, the staff finds that the applicant's list of common bulk commodities in LRA Table 2.4-10 is all-inclusive of those in the in-scope structures described in LRA Sections 2.4.1 through 2.4.9. The staff confirms that the applicant also has verified that there are no Lubrite sliding support bearings and/or surfaces at SSES within the scope of license renewal. Therefore, the staff's concerns described in RAI 2.4.10-1 are resolved.

In RAI 2.4.10-2, dated August 3, 2007, the staff noted based on information provided in LRA Table 2.4-10, that it could not specifically identify the insulation and insulation jacketing included within the scope of license renewal nor the specific subsets of insulation and insulation jacketing included in LRA Table 2.4-10. It was also unclear to the staff whether insulation and jacketing on the RV, RCS, MS system, and FWS have been included. In order to help complete its screening review for insulation and insulation jacketing, the staff requested that the applicant provide the following information:

(a) Identify the structures and structural components designated within the scope of license renewal that have insulation and/or insulation jacketing, and identify their location in the plant. Identify locations of the thermal insulation that serves an intended function in accordance with 10 CFR 54.4(a)(2) and describe the scoping and screening results of thermal insulation and provide technical basis for its exclusion from the scope of license renewal.

(b) For insulation and insulation jacketing materials associated with item (a) above that do not require aging management, submit the technical basis for this conclusion, including plant-specific operating experience.

(c) For insulation and insulation jacketing materials associated with item (a) above that require aging management, indicate the applicable LRA sections that identify the AMPs credited to managing aging.

In its response to RAI 2.4.10-2, dated August 28, 2007, the applicant stated:

> The component type "Reactor vessel thermal insulation" is in the scope of License Renewal for SSES and subject to aging management review as listed in LRA Table 2.4-1. Insulation for Reactor Coolant, Main Steam, and Feedwater System components in the scope of License Renewal is also in-scope at SSES and subject to aging management review as listed in LRA Table 2.4-10 under Component Types "Insulation" and "Insulation jacketing."
>
> (a) LRA Section 2.1.2.6 describes the treatment of insulation, including the identification of the various materials, indication of scope, and evaluation of degradation potential. Thermal insulation provides nonsafety-related insulating characteristics and personnel protection for both safety-related and nonsafety-related mechanical components that contain fluid (liquid or steam).
>
> Piping and equipment insulation is not classified as safety-related and has the intended function to maintain its structural integrity for nonsafety affecting safety (NSAS) considerations, in accordance with 10 CFR 54.4(a)(2), if located in a structure that contains safety-related equipment and components. Insulating materials (insulation and insulation jacketing) that function to limit heat transfer or are required to maintain their structural integrity are in the scope of License Renewal at SSES and subject to aging management review.
>
> Similar to numerous structural components that are not uniquely identified, for which a comprehensive listing of components and location is not feasible, the various in-scope insulation and insulation jacketing materials are addressed as bulk commodities.
>
> (b) Aging management reviews have determined that no aging management is required for insulation and insulation jacketing materials associated with item (a).
>
> As described in LRA Section 2.1.2.6, only stainless steel reflective metal or stainless steel jacketed insulation is used inside containment. In other structures, aluminum or aluminum jacketing is also used. Both stainless steel and aluminum insulating materials are listed in LRA Table 3.5.2-10. These metallic insulating materials are exposed to uncontrolled indoor air and no aging management is required consistent with NUREG-1801 items VII.J-15 and V.F-2, as addressed in LRA items 3.2.1-50 and 3.3.1-94. Furthermore, while aluminum exposed to uncontrolled indoor air is not listed in NUREG-1801 Volume II, Chapters IV or VII, stainless steel and steel exposed to uncontrolled indoor air requires no aging management as listed in item NUREG-1801

items IV.E-2, VIII.I-10 and VIII.I-13. Similarly, in-scope metallic insulation materials for the Reactor Coolant, Main Steam and Feedwater systems do not require aging management. This was not reflected in LRA items 3.1.1-85 or 3.4.1-41.

With respect to other evaluated insulating materials, such as calcium silicate, fiberglass, Flexible “Min-K” (ceramic), woven glass fiber, and ceramic fiber listed in LRA Table 3.5.2-10, aging management is also not required. Operating experience has not identified any age-related degradation of insulation and typical insulation problems are event driven (e.g., mechanical damage), and not considered for license renewal.

The potential for degradation of insulation is described in LRA Section 2.1.2.6. The only plausible aging effects that could result in degradation and failure, affecting the intended function or creating a potential for spatial interaction are those which may cause reaction or corrosion of barriers and coverings or that could impact the insulating materials themselves. The relevant conditions do not exist in the indoor air environment of the subject NSAS component group for the following aging effect(s) to occur:

- Loss of Material due to Corrosion – The SSES site is a location that is rural rather than industrial or coastal and the air is not salt-laden nor does it contain sufficient contaminants (e.g., sulfur) to concentrate and attack the insulation barriers/coverings.
- Loss of Material, Cracking, and/or Change in Material Properties due to Ultra-Violet (UV) Radiation and/or Oxidation – Ultra-violet radiation and the oxidizing effects of the air may also cause deterioration of insulation barriers and coverings. However, the only insulation at SSES that is not either encapsulated in aluminum or stainless steel jacketing, or is reflective metal (stainless steel or aluminum), are for the diesel engine exhaust lines, where “Fibrefrax” cloth blanket is an acceptable alternate jacketing material, and locations that have “Temp-mat” (fiberglass blanket) or “Min-K” (ceramic fiber) insulation. Stainless steel and aluminum jacket materials are resistant to the oxidizing effect of the air, due to the passive layer and are considered impervious to ultraviolet radiation (e.g., plant lighting).

  With respect to “Temp-mat,” “Min-K,” and Fibrefrax (cloth coated alternative) insulation, the limited uses of these insulation types (e.g., diesel exhaust lines, pipe whip restraints, etc.) are not expected to experience sufficient UV radiation (plant lighting) exposure or ambient air oxidation to result in degradation.
- Loss of Material due to Wear – Wear (abrasion) is an applicable aging mechanism for insulation whenever there is relative movement between a surface and an insulation barrier or cover that is in contact. However, wear occurs during the performance of active functions; as a result of improper design, application, or operation; or to a very small degree with insignificant consequences.
- Degradation of Insulating Materials – The insulating materials are fabricated of calcium silicate, glass fiber, or ceramic fiber. As described in LRA Item 3.3.1-93, and others, no aging management is required for glass exposed to uncontrolled indoor air. The thermal resistance (insulating) characteristics of mass insulation systems are not expected to naturally degrade over the course of their service life as proper selection, design and installation for the specific service and condition is assumed. Unless protective coverings of mass insulation systems

are damaged, loss/degradation of insulating material is not a concern. Mass insulation systems used in nuclear plant applications typically are sealed and include a combination of insulating material and a weather barrier, vapor barrier, condensate barrier, or covering for the specific service. This outer covering (or barrier) protects mass insulation from the weather, solar/UV radiation, or atmospheric contaminants, and mechanical damage, but permits the evaporation of any moisture vapor. Furthermore, SSES operating experience supports a lack of degradation in insulating characteristics over the service life of insulation, except as the result of event-driven mechanical damage of coatings/barriers.

Details of the operating experience review and aging management review of non-metallic insulating materials are contained in auditable format and available for onsite review.

(c) There are no aging effects requiring management for any subject insulating material component group that is exposed to indoor air, in order to preclude spatial interaction with safety-related SCs, or for an intended (insulation) function credited in heating analyses.

Based on its review, the staff finds the applicant's response to RAI 2.4.10-2 acceptable because the applicant has verified that the RV insulation is within the scope of license renewal, subject to an AMR, and included under component type "Reactor vessel thermal insulation" in LRA Table 2.4-1. The applicant also verified that insulation for RCS, Main Steam system, and feedwater system components within the scope of license renewal is also within the scope of license renewal, subject to an AMR, and listed under component types "Insulation" and "Insulation jacketing," in LRA Table 2.4-10. The staff confirms that the applicant has provided a detailed review of the various insulating materials in use, the potential for degradation effects, and operating experience. The staff also confirms the applicant's conclusion that, consistent with the GALL Report, Volume II, none of the insulating material used in SSES requires any management for aging affects, because of the applicant's favorable operating experience and because these materials are exposed to an indoor air environment, only. Therefore, the staff's concerns described in RAI 2.4.10-2 are resolved.

In RAI 2.4.10-3, dated August 3, 2007, the staff noted LRA Table 2.4-10 lists "Monorails, hoists and miscellaneous cranes" as a bulk commodity component type subject to an AMR. It is not clear to the staff which specific monorails, hoists and miscellaneous cranes have been identified as within the scope of license renewal, and whether all relevant subcomponents (including bridge and trolley, rails, girders, etc.) of these in-scope items have been screened in as items requiring an AMR. The staff requested that the applicant identify the specific monorails, hoists, and cranes included within the above component type as in-scope and subject to an AMR and those that are excluded, and provide the technical basis the decision. In addition, the staff requested that the applicant confirm whether there are any bridge and trolley, rails, and girders associated with these miscellaneous cranes and whether they are included within the scope of license renewal and subject to an AMR. The staff also requested that the applicant confirm whether fasteners and rail hardware associated with this component type are within the scope of license renewal and subject to an AMR and; if not, provide the technical basis for the exclusion.

In its response to RAI 2.4.10-3, dated August 28, 2007, the applicant stated:

> Monorails, hoists and miscellaneous cranes within License Renewal in-scope structures are also in the scope of License Renewal for SSES and subject to an aging management review. (Refer to response to RAI 2.4.2-3 above)
>
> Relevant subcomponents (including bridge and trolley, rails, and girders) are in the scope of License Renewal for SSES and subject to aging management review. These subcomponents are included under Component Type “Monorails, hoists and miscellaneous cranes” in Table 2.4-10.
>
> Fasteners and rail hardware associated are in the scope of License Renewal for SSES and subject to aging management review. These fasteners and rail hardware included under Component Type “Anchorage / Embedments and Anchor Bolts” in Table 2.4-10.

Based on its review and the applicant’s response to and staff evaluation of RAI 2.4.2-3 in SER Section 2.4.2, the staff finds the applicant’s response to RAI 2.4.10-3 acceptable because the applicant has verified that all monorails, hoists and miscellaneous cranes and the relevant subcomponents are in-scope structures within the scope of license and subject to an AMR. Therefore, the staff’s concern described n RAI 2.4.10-3 is resolved.

2.4.10.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff found a certain lack of clarity but no gross omissions. In addition, the staff’s review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the bulk commodities SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1) and; therefore, is acceptable.

2.5 Scoping and Screening Results: Electrical and Instrumentation and Controls

This section documents the staff’s review of the applicant’s scoping and screening results for electrical and I&C systems. Specifically, this section discusses electrical and I&C component commodity groups

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

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

In its scoping evaluation, the staff reviewed the applicable LRA sections, focusing on components that have not been identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the UFSAR, for each electrical and I&C system to determine whether the applicant has omitted from the scope of license renewal components with intended functions pursuant to 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions in accordance with 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 (a) the functions are performed with moving parts or a change in configuration or properties or (b) the SCs are subject to replacement after a qualified life or specified time period, pursuant to 10 CFR 54.21(a)(1). For those meeting neither of these criteria, the staff sought to confirm that these SCs were subject to an AMR, as required by 10 CFR 54.21(a)(1). The staff requested additional information to resolve any omissions or discrepancies identified.

2.5.1 Electrical and Instrumentation and Controls Component Commodity Groups

2.5.1.1 Summary of Technical Information in the Application

In LRA Section 2.5, the applicant described the electrical and I&C component commodity groups, which include the following:

- Non-EQ Insulated Cables and Connections
- Non-Segregated Metal-Enclosed (Phase) Bus
- High-Voltage Insulators
- Transmission Conductors and Connections

The non-EQ insulated cables and connections commodity group includes all in-scope electric power cables, control cables, and instrumentation cables and in-scope connections not addressed by the EQ program. An insulated cable is an assembly consisting of a conductor (aluminum or copper) with an insulated covering, fillers, and a jacket to cover the entire assembly; however, the insulation is the only portion subject to evaluation. Cable connectors connect the cable conductors with other cables or with motors, instruments, and a variety of electrical devices. Insulated cables and connections connect specified portions of electrical circuits to deliver voltage, current, or signals.

The nonsegregated metal-enclosed bus under review for license renewal is within its own passive enclosure and not part of any switchgear, a load center, motor control center, or other active component. According to Institute of Electrical and Electronic Engineers 100-1984, "The IEEE Standard Dictionary of Electrical and Electronics Terms," a nonsegregated phase bus is constructed with all phase conductors in a common metal enclosure without barriers (*i.e.*, with only air space) between the phases. Nonsegregated metal-enclosed buses connect two or more elements of electric power circuits like switchgear, transformers, switches, and other active electrical components. The license renewal review of nonsegregated metal-enclosed buses includes only the bus sections between the active electrical components. The distribution bus and the connections inside the enclosures of the active components are inspected and maintained as parts of active components and therefore excluded from any AMR. Nonsegregated metal-enclosed buses provide electrical connections to specified portions of electrical circuits to deliver voltage and current.

A high-voltage insulator is a component uniquely designed to support a high-voltage conductor physically and to separate the conductor electrically from another conductor or object. The applicant's high-voltage insulators evaluated for license renewal include those supporting and insulating high-voltage electrical components (*i.e.*, transmission conductors and connections, particularly those for offsite power supplies). There are two basic types of insulators: (1) station post and (2) strain (or suspension) insulators. Station post insulators are large and rigid. They support stationary equipment (*e.g.*, short lengths of transmission conductors and disconnect switches). Strain insulators are for applications where movement of the supported conductor is expected and allowed, for example, to maintain tensional support of transmission conductors between towers or other supporting structures. The high-voltage insulators within the scope of license renewal are the station post insulators and strain insulators associated with the offsite power supplies.

Transmission conductors are in the category of aluminum conductor steel-reinforced, aluminum-strand conductors wrapped around a steel core. They are uninsulated, high-voltage conductors that carry loads in plant switchyards and in distribution applications. Transmission conductor connections are cast aluminum. The sections of transmission-type conductors at SSES within the scope of license renewal are conductors associated with the offsite power supplies. The transmission conductor sections are included to follow the guidance of Revision 1 of the SRP-LR for offsite power restoration after an SBO.

The electrical and I&C component commodity groups perform functions that support SBO. LRA Table 2.5.2-1 identifies electrical and I&C component commodity group component types within the scope of license renewal and subject to an AMR:

- cable connections (metallic parts)
- fuse holders (insulation, metallic clamp)
- medium-voltage power cables
- metal-enclosed bus, non-segregated (bus and connections)
- metal-enclosed bus, non-segregated (enclosure assemblies)
- metal-enclosed bus, non-segregated (insulation and insulators)
- non-EQ insulated cables and connections
- non-EQ low-current instrument cables and connections
- high-voltage insulators
- transmission conductors and connections

The intended functions of the electrical and I&C component commodity group component types within the scope of license renewal include:

- electrical connection to specified electrical circuit portions for voltage, current, or signal delivery
- electrical conductor insulation and support

2.5.1.2 Staff Evaluation

The staff reviewed LRA Section 2.5 and UFSAR Sections 8.1, 8.2, and 8.3, using the evaluation methodology described in SER Section 2.5 and the guidance in SRP-LR Section 2.5.

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

In RAI 2.5-1 dated July 30, 2007, the staff noted that according to LRA Section 2.5, the high-voltage switchyard circuit breakers that connect to the offsite sources, the circuits connecting the startup transformers to the switchyard, and the associated components and structures are not presently included within the scope of license renewal. GDC 17 requires that electric power from the transmission network to the onsite electric distribution system be supplied by two physically independent circuits to minimize the likelihood of their simultaneous failure. In addition, the staff noted that the guidance provided by letter dated April 1, 2002, "Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout Rule (10 CFR 50.63) for License Renewal (10 CFR 54.4(a)(3))," and later incorporated in SRP-LR Section 2.5.2.1.1, states:

> For purposes of the license renewal rule, the staff has determined that the plant system portion of the offsite power system that is used to connect the plant to the offsite power source should be included within the scope of the rule. This path typically includes switchyard circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and transformer and onsite electrical system, and the associated control circuits and structures. Ensuring that the appropriate offsite power system long-lived passive SCs that are part of this circuit path are subject to an AMR will assure that the bases underlying the SBO requirements are maintained over the period of extended license.

Moreover, the proposed interim staff guidance (ISG) states that each path should include the following:

> The switchyard circuit breakers at transmission system voltage (69 kV and higher) that connect to the offsite system power transformers, the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and transformer and onsite electrical distribution system, and the associated control circuits and structures.

The staff determined that the offsite power recovery path, from two independent sources from the switchyard to the plant Class 1E safety buses, includes:

- switchyard circuit breakers that connect to the offsite power system (i.e., grid)
- offsite system power transformers

- the intervening overhead or underground circuits (i.e., cables, buses and connections, transmission conductors and connections, insulators, disconnect switches, and associated components)
- circuits between the circuit breakers and power transformers
- circuits between the power transformers and onsite electrical distribution system
- the associated control circuits and structures

The staff believes that the switchyard is part of the plant system and that the SBO recovery paths, up to the switchyard circuit breakers that connect to the offsite system power transformers, should be within the scope of license renewal, in accordance with staff guidance in SRP-LR Section 2.5.2.1.1. The SSCs within the scope of license renewal should include a circuit breaker at transmission voltage, to ensure adequate protection of the safety bus and ensure recovery of offsite sources. The staff believes that the circuit breaker should be within the scope of license renewal because its intended function is to maintain electrical continuity. The circuit breaker maintains independence of offsite power sources, affords selective protection to minimize the probability of loss of offsite power, and reduces transients from affecting the onsite distribution system. For these reasons, a circuit breaker remains as the scoping boundary. Using a disconnect switch or other component downstream of the breaker is not consistent with the staff position for compliance with the SBO rule and is not acceptable for meeting the SBO scoping requirements for license renewal. Therefore, the staff concludes that the SBO recovery path that should be included in the scope of license renewal is circuits up to and including the switchyard circuit breakers, at transmission voltage. Furthermore, the associated control circuits and structures for the circuit breakers also should be included within the scope of license renewal.

The staff clarified that both paths used to control the offsite circuits to the plant should be within the scope of license renewal. The staff requested that the applicant justify why these components are not within the scope of license renewal and explain, in detail, which high-voltage breakers and other components in the switchyard will be connected from the startup transformers T10 and T20 up to the offsite power system for the purpose of SBO recovery.

In its response to RAI 2.5-1, dated August 23, 2007, the applicant stated that the 230 kV equipment on the transmission system side of the motor-operated disconnects is not within the scope of license renewal because they are part of the transmission system grid and not part of the plant system. During a telephone conference, dated October 3, 2007, the staff informed the applicant that its response to RAI 2.5-1 was not acceptable because is not consistent with staff guidance. The staff determined that the switchyard is part of the plant system and that the SBO recovery paths should be within the scope of license renewal, in accordance with the ISG.

In letter dated May 7, 2008, the applicant modified the SBO recovery path for SSES, as shown in LRA Figure 2.5-1, “Graphical Representation of the SSES SBO License Renewal Boundary.” The SSES SBO recovery path includes the transmission conductors from startup transformers T10 and T20 to circuit breakers in the switchyard as well as the circuit breakers themselves. The scoping boundary is at the transmission system side of the circuit breakers. From startup transformer T10, the scoping boundary is 230 kV circuit breakers 2T and 2S. For the SBO recovery path with startup transformer T20, the boundary is 230kV circuit breakers 2T and 2W and also, a 230kV circuit breaker on the 230kV-500kV tie line, as shown in LRA Figure 2.5-1.

Based on its review, the staff finds the applicant's response to RAI 2.5-1 acceptable because the applicant has verified that both SBO recovery paths are within the scope of license renewal. The staff finds the applicant's response acceptable since the licensee has included switchyard circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and transformer and onsite electrical system, and the associated control circuits and structures in the scope of license renewal, in accordance with SRP-LR Section 2.5.2.1.1. The staff confirms the applicant's change from motor-operated disconnects to circuit breakers at transmission system voltage in the SBO recovery path, is consistent with the proposed ISG (2008-01). Therefore, the staff's concern described in RAI 2.5-1 is resolved.

In RAI 2.5-2 dated July 30, 2008, the staff requested confirmation that the control circuits and structures associated with the 230 kV circuit breakers are within the scope of license renewal, consistent with the requirements of 10 CFR 54.4(a)(3) and the guidance found in SRP-LR Sections 2.1.3.1.3 and 2.5.2.1.1.

In its response to RAI 2.5-2, dated August 29, 2008, the applicant revised the LRA to include the control circuits within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.5-2 acceptable because the applicant has revised the LRA to include the control circuits within the scope of license renewal, consistent with staff guidance. Therefore, the staff's concern described in RAI 2.5-2 is resolved.

2.5.1.3 Conclusion

The staff reviewed the LRA, USAR, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the electrical and I&C component commodity groups 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) and; therefore is acceptable.

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 Susquehanna Steam Electric Station (SSES Units 1 and 2, by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff). In Appendix B of its license renewal application (LRA), Pennsylvania Power & Light (PPL) Susquehanna, LLC (PPL or the applicant) described the 50 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) structures, systems, 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.

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 week of May 5th. The onsite audits and reviews are designed tor maximumize efficiency of the staff's LRA review. The applicant can respond to questions, the staff can readily evaluate the applicant's responses, the need for formal correspondence between the staff and the applicant is reduced, and the result is an improvement in review efficiency. The results of this audit were documented in the report of January 16, 2009.

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 SSES 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 Report AMP)

The format of each Table 1 allows the staff to align a specific row in the table with the corresponding GALL Report table row so that the consistency can be checked easily.

3.0.1.2 Overview of Table 2s

Each Table 2 provides the detailed results of the AMRs for components identified in LRA Section 2 as subject to an AMR. The LRA has a Table 2 for each of the systems or structures within a specific system grouping (*e.g.*, reactor coolant system, engineered safety features, auxiliary systems, etc.). For example, the engineered safety features group has tables specific to the core spray system, HPCI system, and RHR system. Each Table 2 consists of nine columns:

- Component Type – The first column lists LRA Section 2 component types subject to an AMR in alphabetical order.
- Intended Function – The second column identifies the license renewal intended functions, including abbreviations, where applicable, for the listed component types. Definitions and abbreviations of intended functions are in LRA Table 2.0-1.
- Material – The third column lists the particular construction material(s) for the component type.
- Environment – The fourth column lists the environments to which the component types are exposed. Internal and external service environments are indicated with a list of these environments in LRA Tables 3.0-1 and 3.0-2.
- Aging Effect Requiring Management – The fifth column lists aging effects requiring management (AERMs). As part of the AMR process, the applicant determined any AERMs for each combination of material and environment.
- Aging Management Programs – The sixth column lists the AMPs that the applicant uses to manage the identified aging effects.
- 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 compared each combination of component type, material, environment, AERM, and AMP in LRA Table 2 with the GALL Report items. If there are no corresponding items in the GALL Report, the applicant leaves the column blank in order to identify the AMR results in the LRA tables corresponding to the items in the GALL Report tables.
- Table 1 Item – The eighth column lists the corresponding summary item number from LRA Table 1. If the applicant identifies in each LRA Table 2 AMR results consistent with the GALL Report, the Table 1 line item summary number should be listed in LRA Table 2. If there is no corresponding item in the GALL Report, column eight is left blank. In this manner, the information from the two tables can be correlated.
- Notes – The ninth column lists the corresponding notes used to identify how the information in each Table 2 aligns with the information in the GALL Report. The notes, identified by letters, were developed by an NEI work group and will be used in future LRAs. Any plant-specific notes identified by numbers provide additional information about the consistency of the line item with the GALL Report.

3.0.2 Staff's Review Process

The staff conducted three types of evaluations of the AMRs and AMPs:

(1) For items that the applicant had stated were consistent with the GALL Report, the staff conducted either an audit or a technical review to determine consistency.

(2) For items that the applicant had stated were consistent with the GALL Report with exceptions, enhancements, or both, the staff conducted either an audit or a technical review of the item to determine consistency. In addition, the staff conducted either an audit or a technical review of the applicant's technical justifications for the exceptions or the adequacy of the enhancements.

    The SRP-LR states that an applicant may take one or more exceptions to specific GALL AMP elements; however, any deviation from or exception to the GALL AMP should be described and justified. Therefore, the staff considers exceptions as being portions of the GALL AMP that the applicant does not intend to implement.

    In some cases, an applicant may choose an existing plant program that does not meet all the program elements defined in the GALL AMP. However, the applicant may make a commitment to augment the existing program to satisfy the GALL AMP prior to the period of extended operation. Therefore, the staff considers these augmentations or additions to be enhancements. Enhancements include, but are not limited to, activities needed to ensure consistency with the GALL Report recommendations. Enhancements may expand, but not reduce, the scope of an AMP.

(3) For other items, the staff conducted a technical review to verify conformance with 10 CFR 54.21(a)(3) requirements.

Staff audits and technical reviews of the applicant's AMPs and AMRs determine whether the aging effects on SCs can be adequately managed to maintain their intended function(s) consistent with the plant's current licensing basis (CLB) for the period of extended operation, as required by 10 CFR Part 54.

3.0.2.1 Review of AMPs

For AMPs which the applicant claimed consistency with the GALL AMPs, the staff conducted either an audit or a technical review to verify the claim. For each AMP with one or more deviations, the staff evaluated each deviation to determine whether the deviation was acceptable and whether the modified AMP would adequately manage the aging effect(s) for which it was credited. For AMPs not evaluated in the GALL Report, the staff performed a full review to determine their adequacy. The staff evaluated the AMPs against the following 10 program elements defined in SRP-LR Appendix A:

(1) Scope of the Program – Scope of the program should include the specific SCs subject to an AMR for license renewal.

(2) Preventive Actions – Preventive actions should prevent or mitigate aging degradation.

(3) Parameters Monitored or Inspected – Parameters monitored or inspected should be linked to the degradation of the particular structure or component intended function(s).

(4) Detection of Aging Effects – Detection of aging effects should occur before there is a loss of structure or component intended function(s). This includes aspects such as

method or technique (*i.e.*, visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new/one-time inspections to ensure timely detection of aging effects.

(5) Monitoring and Trending – Monitoring and trending should provide predictability of the extent of degradation, as well as timely corrective or mitigative actions.

(6) Acceptance Criteria – Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the structure or component intended function(s) are maintained under all CLB design conditions during the period of extended operation.

(7) Corrective Actions – Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(8) Confirmation Process – Confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.

(9) Administrative Controls - Administrative controls should provide for a formal review and approval process.

(10) Operating Experience – Operating experience of the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support the conclusion that the effects of aging will be adequately managed so that the SC intended function(s) will be maintained during the period of extended operation.

Details of the staff's audit evaluation of program elements (1) through (6) are documented in SER Section 3.0.3.

The staff reviewed the applicant's quality assurance (QA) program and documented its evaluations in SER Section 3.0.4. The staff's evaluation of the QA program included assessment of program element (7) "corrective actions," (8)"confirmation process," and (9)"administrative controls" program elements.

The staff reviewed the information on the "operating experience" program element and documented its evaluation in SER Section 3.0.3.

3.0.2.2 Review of AMR Results

Each LRA Table 2 contains information concerning whether or not the AMRs identified by the applicant align with the GALL Report AMRs. For a given AMR in a Table 2, the staff reviewed the intended function, material, environment, AERM, and AMP combination for a particular system component type. Item numbers in column seven of the LRA, "NUREG-1801 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 updated final safety analysis report (UFSAR) supplement, which summarizes the applicant's programs and activities for managing aging effects for the period of extended operation, as required by 10 CFR 54.21(d).

3.0.2.4 Documentation and Documents Reviewed

In its review, the staff used the LRA, LRA supplements, the SRP-LR, and the GALL Report.

During the onsite audit, the staff also examined the applicant's justifications to verify that the applicant's activities and programs will adequately manage the effects of aging on SCs. The staff also conducted detailed discussions and interviews with the applicant's license renewal project personnel and others with technical expertise relevant to aging management.

3.0.3 Aging Management Programs

SER Table 3.0.3-1 presents the AMPs credited by the applicant and described in LRA Appendix B. The table also indicates the SSCs that credit the AMPs and the GALL AMP with which the applicant claimed consistency and shows the section of this SER in which the staff's evaluation of the program is documented.

Table 3.0.3-1 SSES Aging Management Programs

SSES AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Inservice Inspection (ISI) Program (B.2.1)	Existing	Consistent with exception	XI.M1	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.1
BWR Water Chemistry Program (B.2.2)	Existing	Consistent	XI.M2	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion systems / containments, structures, and component supports	3.0.3.1.1
Reactor Head Closure Studs Program (B.2.3)	Existing	Consistent	XI.M3	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.2
BWR Vessel ID Attachment Welds Program (B.2.4)	Existing	Consistent	XI.M4	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.3
BWR Feedwater Nozzle Program (B.2.5)	Existing	Consistent	XI.M5	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.4
BWR CRD Return Line Nozzle Program (B.2.6)	Existing	Consistent with exception	XI.M6	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.2
BWR Stress Corrosion Cracking (SCC) Program (B.2.7)	Existing	Consistent	XI.M7	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.5

SSES AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
BWR Penetrations Program (B.2.8)	Existing	Consistent with exception	XI.M8	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.3
BWR Vessel Internals Program (B.2.9)	Existing	Consistent with enhancement	XI.M9	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.4
Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program (B.2.10)	New	Consistent	XI.M13	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.6
Flow-Accelerated Corrosion (FAC) Program (B.2.11)	Existing	Consistent	XI.M17	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion systems	3.0.3.1.7
Bolting Integrity Program (B.2.12)	Existing	Consistent with exceptions and enhancement	XI.M18	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion systems	3.0.3.2.5
Piping Corrosion Program (B.2.13)	Existing	Consistent with exceptions	XI.M20	engineered safety features / auxiliary systems	3.0.3.2.6
Closed Cooling Water Chemistry Program (B.2.14)	Existing	Consistent with exceptions	XI.M21	auxiliary systems	3.0.3.2.7
Crane Inspection Program (B.2.15)	Existing	Consistent	XI.M23	containments, structures, and component supports	3.0.3.1.8
Fire Protection Program (B.2.16)	Existing	Consistent with exceptions	XI.M26	containments, structures, and component supports	3.0.3.2.8
Fire Water System Program (B.2.17)	Existing	Consistent with enhancements	XI.M27	engineered safety features / auxiliary systems	3.0.3.2.9
Buried Piping Surveillance Program (B.2.18)	New	Consistent with exception	XI.M28	auxiliary systems	3.0.3.2.10

SSES AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Condensate and Refueling Water Storage Tanks Inspection (B.2.19)	New	Consistent	XI.M29	steam and power conversion systems	3.0.3.1.9
Fuel Oil Chemistry Program (B.2.20)	Existing	Consistent with exceptions	XI.M30	auxiliary systems	3.0.3.2.11
Reactor Vessel Surveillance Program (B.2.21)	Existing	Consistent with exception	XI.M31	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.12
Chemistry Program Effectiveness Inspection (B.2.22)	New	Consistent	XI.M32	engineered safety features / auxiliary systems / steam and power conversion systems	3.0.3.1.10
Cooling Units Inspection (B.2.23)	New	Consistent	XI.M32	auxiliary systems	3.0.3.1.11
Heat Exchanger Inspection (B.2.24)	New	Consistent	XI.M32	engineered safety features / auxiliary systems	3.0.3.1.12
Lubricating Oil Inspection (B.2.25)	New	Consistent	XI.M32	engineered safety features / auxiliary systems	3.0.3.1.13
Main Steam Flow Restrictor Inspection (B.2.26)	New	Consistent	XI.M32	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.14
Monitoring and Collection System Inspection (B.2.27)	New	Consistent	XI.M32	auxiliary systems	3.0.3.1.15
Supplemental Piping/Tank Inspection (B.2.28)	New	Consistent	XI.M32	engineered safety features / auxiliary systems / steam and power conversion systems	3.0.3.1.16
Selective Leaching Inspection (B.2.29)	New	Consistent	XI.M33	engineered safety features / auxiliary systems / steam and power conversion systems	3.0.3.1.17
Buried Piping and Tanks Inspection Program (B.2.30)	New	Consistent with exceptions	XI.M34	auxiliary systems / steam and power conversion systems	3.0.3.2.13
Small Bore Class 1 Piping Inspection (B.2.31)	New	Consistent	XI.M35	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.18

SSES AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
System Walkdown Program (B.2.32)	Existing	Consistent with enhancements	XI.M36	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion systems	3.0.3.2.14
Lubricating Oil Analysis Program (B.2.33)	Existing	Consistent with exception and enhancement	XI.M39	engineered safety features / auxiliary systems	3.0.3.2.15
Inservice Inspection (ISI) Program - IWE (B.2.34)	Existing	Consistent	XI.S1	containments, structures, and component supports	3.0.3.1.19
Inservice Inspection (ISI) Program - IWL (B.2.35)	Existing	Consistent	XI.S2	containments, structures, and component supports	3.0.3.1.20
Inservice Inspection (ISI) Program - IWF (B.2.36)	Existing	Consistent	XI.S3	containments, structures, and component supports	3.0.3.1.21
Containment Leakage Rate Test Program (B.2.37)	Existing	Consistent	XI.S4	containments, structures, and component supports	3.0.3.1.22
Masonry Wall Program (B.2.38)	Existing	Consistent with enhancement	XI.S5	containments, structures, and component supports	3.0.3.2.16
Structures Monitoring Program (B.2.39)	Existing	Consistent with enhancements	XI.S6	containments, structures, and component supports / electrical and instrumentation and controls	3.0.3.2.17
RG 1.127 Water-Control Structures Inspection (B.2.40)	Existing	Consistent with enhancements	XI.S7	containments, structures, and component supports	3.0.3.2.18
Non-EQ Electrical Cables and Connections Visual Inspection Program (B.2.41)	New	Consistent	XI.E1	electrical and instrumentation and controls	3.0.3.1.23
Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program (B.2.42)	New	Consistent	XI.E2	electrical and instrumentation and controls	3.0.3.1.24
Non-EQ Inaccessible Medium-Voltage Cables Program (B.2.43)	New	Consistent	XI.E3	electrical and instrumentation and controls	3.0.3.1.25

SSES AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Metal-Enclosed Bus Inspection Program (B.2.44)	New	Consistent	XI.E4	electrical and instrumentation and controls	3.0.3.1.26
Non-EQ Electrical Cable Connections Program (B.2.45)	New	Consistent	XI.E6	electrical and instrumentation and controls	3.0.3.1.27
Area-Based NSAS Inspection (B.2.46)	New	Plant-specific	N/A	auxiliary systems	3.0.3.3.1
Leak Chase Channel Monitoring Activities (B.2.47)	Existing	Plant-specific	N/A	containments, structures, and component supports	3.0.3.3.2
Preventive Maintenance Activities - RCIC/HPCI Turbine Casings (B.2.48)	Existing	Plant-specific	N/A	engineered safety features	3.0.3.3.3
Preventive Maintenance Activities – Main Turbine (B2.49)	Existing	Plant-Specific	N/A	engineered safety features	3.0.3.3.4
Fuse Holders Program (B.2.50)	New	Consistent with exceptions	XI.E5	electrical and instrumentation and controls	3.0.3.2.20
Fatigue Monitoring Program (B.3.1)	Existing	Consistent with enhancements	X.M1	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion systems / containments, structures, and component supports	3.0.3.2.19
EQ Program (B.3.2)	Existing	Consistent	X.E1	electrical and instrumentation and controls	3.0.3.1.28

*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:

- Boiling Water Reactor (BWR) Water Chemistry Program
- Reactor Head Closure Studs Program
- BWR Vessel Inside Diameter (ID) Attachment Welds Program
- BWR Feedwater Nozzle Program
- BWR Stress Corrosion Cracking (SCC) Program

- Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program
- Flow-Accelerated Corrosion (FAC) Program
- Crane Inspection Program
- Condensate and Refueling Water Storage Tanks Inspection
- Chemistry Program Effectiveness Inspection
- Cooling Units Inspection
- Heat Exchanger Inspection
- Lubricating Oil Inspection
- Main Steam Flow Restrictor Inspection
- Monitoring and Collection System Inspection
- Supplemental Piping/Tank Inspection
- Selective Leaching Inspection
- Small Bore Class 1 Piping Inspection
- Inservice Inspection Program (ISI) Program - IWE
- ISI Program - IWL
- ISI Program - IWF
- Containment Leakage Rate Test Program
- Non-EQ Electrical Cables and Connections Visual Inspection Program
- Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program
- Non-EQ Inaccessible Medium-Voltage Cables Program
- Metal-Enclosed Bus Inspection Program
- Non-EQ Electrical Cable Connections Program
- Environmental Qualification (EQ) Program

3.0.3.1.1 BWR Water Chemistry Program

Summary of Technical Information in the Application. In LRA Section B.2.2, the applicant described the existing BWR Water Chemistry Program as consistent with GALL AMP XI.M2, “Water Chemistry.” The applicant stated that the BWR Water Chemistry Program is a mitigation program that manages potential aging effects for plant components in a treated water environment. The applicant also stated that the program manages loss of material and cracking through monitoring and control of relevant water chemistry parameters, such as sulfates, halogens, dissolved oxygen, and conductivity, consistent with applicable Electric Power Research Institute (EPRI) water chemistry guidelines.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff reviewed the applicant’s AMP evaluation report for the BWR Water Chemistry Program, together with implementing procedures and supporting documentation related to the program. The staff noted that the program elements in the AMP that the applicant claimed as consistent with the GALL Report are consistent with the corresponding program element criteria recommended in GALL AMP XI.M2, with the exception of two program element aspects which the staff determined a need for additional clarification and for which a request for additional information (RAI) was issued. The staff evaluates these aspects of the AMP in the following discussion.

In RAI B.2.2-1, item 1, dated June 23, 2008, the staff noted the following on program elements that the applicant claimed to be consistent with GALL AMP XI.M2:

> Item 1 (on "parameters monitored/inspected") - In the GALL Report, this program element refers to BWRVIP-29 (EPRI TR-103515), "BWR Water Chemistry Guidelines – 1996 Revision," or later revisions, which recommends continuous monitoring of local electrochemical corrosion potential. However, in lieu of direct electrochemical corrosion potential monitoring, the applicant currently relies on monitoring of dissolved oxygen for indication of relevant conditions for corrosion. The staff requested that the applicant provide a technical justification as to why this deviation from the EPRI guidelines is acceptable and explain why this is not considered to be an exception to the GALL Report.

In its response to RAI B.2.2-1, item 1, dated July 17, 2008, the applicant provided the following discussion:

> EPRI TR-103515 recommends continuous monitoring of local electrochemical corrosion potential (ECP) during reactor power operation (greater than 10 percent rated power) as a method to demonstrate the effectiveness of hydrogen water chemistry (HWC). EPRI TR-103515 also describes alternative techniques using predictive models to verify the effectiveness of HWC. In such instances, TR-103515 recommends models be benchmarked against ECP measurements in radiolytically identical and operationally similar applications and a correlation be developed between protective chemistry conditions, e.g., ECP, and other plant (secondary) parameters that respond to hydrogen injection and are normally continuously monitored. As described in TR-103515, secondary plant parameters such as feedwater hydrogen flow rate or concentration, normalized main steam line radiation or main steam line oxygen concentration, and reactor coolant oxygen or hydrogen concentration can be directly related to primary parameters such as ECP. The correlation between ECP and secondary parameters, such as dissolved oxygen, is essential since the useful life for the ECP probes can be less than a fuel cycle.
>
> The BWR Water Chemistry program continuously monitors reactor water for dissolved oxygen concentration and uses hydrogen injection to reduce dissolved oxygen to protective levels (equivalent to ECP of less than -230 mV SHE [standard hydrogen electrode]). ECP measurements were taken during initial implementation of HWC and correlated with secondary parameters, including dissolved oxygen. When dissolved oxygen is not available, other secondary parameter correlations may be used to determine that protection is being achieved. Therefore, since the use of dissolved oxygen in lieu of continuous monitoring of ECP is consistent with the EPRI TR-103515 guidelines, no exception to GALL is required.

In evaluating the applicant's response, the staff reviewed EPRI TR-103515-R2, Section 2.10.3, “Secondary Monitoring Parameters,” and Section 5.4, “Alternate ECP Estimation Techniques.” The staff confirms that the EPRI guidelines include provisions for using secondary plant parameters, such as dissolved oxygen, in lieu of continuous electrochemical corrosion potential monitoring. The EPRI guidelines state that plant-specific correlations should be developed to relate secondary parameter values to electrochemical corrosion potential measurements and can be used when direct electrochemical corrosion potential monitoring is not available.

Based on its review, the staff finds the applicant’s response to RAI B.2.2-1, item 1 acceptable because the applicant has developed plant-specific correlations relating continuously monitored parameters to measured electrochemical corrosion potential values, which are consistent with the EPRI TR-103515 that is endorsed by the GALL Report, and the applicant uses those monitored parameters to control electrochemical corrosion potential at recommended protective levels. The staff determines that the applicant’s response is acceptable and that this aspect of the applicant’s program is consistent with the recommendations in the GALL Report. Therefore, the staff’s concern described in RAI B.2.2-1, item 1 is resolved.

In RAI B.2.2-1, item 2, dated June 23, 2008, the staff noted the following on program elements that the applicant claimed to be consistent with GALL AMP XI.M2:

> Item 2 (on “monitoring and trending”) - In the GALL Report, this program element refers to the EPRI water chemistry guidelines, TR-103515, or later revisions, which recommends weekly monitoring of conductivity, chlorides, and sulfate in the condensate storage tank (CST); however, the applicant currently measures conductivity, chlorides, and sulfate in the CST on a monthly basis. The staff requested that the applicant provide a technical justification as to why this deviation from the EPRI guidelines is acceptable and explain why this is not considered to be an exception to the GALL Report.

In its response to RAI B.2.2-1, item 2, dated July 17, 2008, the applicant provided the following discussion:

> EPRI TR-103515 recommends weekly monitoring of conductivity, chlorides, and sulfates in the condensate storage tank but allows for reduced monitoring if the sources of water are monitored. During normal power operation, all source water to the condensate storage tanks is routinely monitored for conductivity, chlorides, and sulfates. Therefore, the BWR Water Chemistry Program is consistent with the EPRI guidance and the monitoring frequency is not considered to be an exception to GALL.

In evaluating the applicant’s response, the staff reviewed EPRI TR-103515-R2, Table B-1, “Diagnostic Parameters for Demineralized Water Storage Tank (DWST) and Condensate Storage Tank (CST).” The staff confirms that a note associated with this table states that the frequency of CST analyses may be reduced or eliminated if all source water is routinely monitored for conductivity, chlorides, and sulfates parameters. The staff noted that the applicant's response states that during normal power operation all source water to the CST is routinely monitored. The staff also noted that EPRI TR-103515-R2 states that each plant should use the guidelines to develop site-specific procedures identifying parameters to be monitored, along with recommended frequencies and limits. Because the applicant provides routine monitoring for all source water to the CST during normal power operation and the EPRI guidelines describe the monitoring frequencies as recommendations, rather than requirements, the staff finds the reduction in CST monitoring frequency from weekly to monthly to be acceptable and to be consistent with the recommendations in EPRI TR-103515, which is endorsed by the GALL Report. On this basis, the staff finds the applicant's response to RAI B.2.2-1, item 2 to be acceptable and this aspect of the applicant's program to be consistent with the recommendations in the GALL Report.

Based on its review, and resolution of the related RAI as described above, the staff finds the applicant's BWR Water Chemistry Program consistent with the program elements of GALL AMP XI.M2 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's operating experience (OE) described in LRA Section B.2.2. The applicant stated that the BWR Water Chemistry Program incorporates EPRI and Institute of Nuclear Power Operations (INPO) guideline documents as well as lessons learned from site and other utility OE. The applicant stated that the program has been and continues to be subject to internal and external assessments of the performance to identify strengths and potential adverse trends. The applicant further stated that plant-specific OE did not reveal a loss of component intended function for components exposed to reactor coolant, feedwater (FW), condensate, control rod drive (CRD) hydraulic water, or accident mitigation water (i.e., suppression pool water) that could be attributed to an inadequacy of the BWR Water Chemistry Program.

During the onsite audit, the staff reviewed the applicant's OE reports for the BWR Water Chemistry Program. The staff reviewed selected corrective action condition reports (CRs) related to the BWR Water Chemistry Program and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience.

The staff noted that the applicant has a history of CRs related to high sulfate levels in reactor water for a period of several days following refueling outages (RFOs), and that the applicant has undertaken root cause evaluations and programmatic changes to reduce and control the high sulfate levels. The applicant stated that there have been no component failures attributed to the transient elevation of sulfate in the reactor following refueling.

In RAI B.2.2-2, dated June 23, 2008, the staff requested that the applicant explain its activities related to understanding and mitigating this chemistry program issue, addressing the cause of the problem, corrective actions and comparisons with other BWRs having similar condensate demineralizers.

In its response to RAI B.2.2-2, dated July 17, 2008, the applicant provided the following discussion:

> The elevated sulfate levels following refueling outages were determined to be the result of operational actions, such as removing a condensate pump from service, which disturbed or upset the condensate demineralizer resin bed and allowed the cation resin, which releases sulfate and organic sulfonates, to migrate to near the outlet (bottom) of the resin bed. When the condensate demineralizers were restarted after an outage, the sulfates and sulfonates that had concentrated in the bed during the outage washed out of the cation resin at the bottom of the demineralizer bed and caused the elevated sulfate levels. The elevated sulfate levels continued for a week or two, until the excess was rinsed off the beds or new anion resin heels were added to the vessels.

PPL undertook two corrective actions to mitigate the elevated sulfate level issue. One included a change in operation of the condensate demineralizers and/or condensate pumps as they are taken out of service. The procedures were changed to bypass the condensate demineralizer so as to not upset the beds during initial startup or final shutdown of the condensate pumps. Another corrective action rinses the resin bed with demineralized water before starting the condensate demineralizer. The out of service condensate demineralizer resin bed is covered with demineralized water which is flushed to radwaste, taking any excess sulfates with it, thus mitigating the elevated sulfate level. The condensate demineralizer is placed in service after the rinse is completed.

In addition, PPL installed a condensate filtration system in the late 1990s. Since then, PPL has experienced a continually improving trend in sulfate levels, including the elevated sulfate levels following each outage. PPL maintains sulfate data as a monthly average, as reported to INPO. The data shows that monthly average sulfate levels following outages have not exceeded 5 ppb since completion of the Unit 2 outage in 2003.

These actions have resulted in monthly average sulfate levels that are typically below 2 ppb and often below 1 ppb. Comparison of SSES with other BWRs having similar filters and condensate demineralizers, based on October 2007 data, places both SSES units above the median value, but below the EPRI recommended goal of 2 ppb.

Based on the review, that staff finds the applicant's response to RAI B.2.2-2 acceptable because the applicant has verified that its OE is within the envelope of industry experience and the applicant's BWR Water Chemistry Program has demonstrated its ability to detect and correct operational problems. Therefore, the staff's concern described in RAI B.2.2-2 is resolved.

Based on this review, the staff finds that the OE for this AMP demonstrates that the applicant's BWR Water Chemistry Program is achieving its objective of mitigating loss of material due to general, crevice and pitting corrosion and cracking caused by SSC in steel and/or stainless steel exposed to treated water; and that the applicant is taking appropriate corrective actions through implementation of this program.

The staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement for the BWR Water Chemistry Program in LRA Section A.1.2.11. The staff notes that the UFSAR supplement's description for the BWR Water Chemistry Program conforms to the recommended UFSAR supplement for this type of program as described in the SRP-LR. The staff also notes that in LRA Table A-1, Commitment No. 2, the applicant committed to ongoing implementation of the BWR Water Chemistry Program for aging management of applicable components, during the period of extended operation.

Based on the review, the staff finds that the UFSAR supplement summary in LRA Section A.1.2.11 provides an acceptable description of the applicant's BWR Water Chemistry

Program because it is consistent with the UFSAR supplement summary description in the SRP-LR for the Water Chemistry Program. The staff also finds 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 the review of the applicant's BWR Water Chemistry Program and the applicant's responses and resolutions of the related RAIs, 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) and; therefore, is acceptable.

3.0.3.1.2 Reactor Head Closure Studs Program

Summary of Technical Information in the Application. In LRA Section B.2.3, the applicant described the existing Reactor Head Closure Studs AMP as consistent with the GALL AMP XI.M3, "Reactor Head Closure Studs." The Reactor Head Closure Studs Program provides for condition monitoring and preventive actions to manage stud cracking. The program is implemented through plant procedures based on the inspection requirements specified in the American Society of Mechanical Engineers (ASME) Code, Section XI, Subsection IWB, Table IWB 2500-1, and the preventive measures described in Regulatory Guide (RG) 1.65.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's onsite documentation supporting the applicant's conclusion that the program elements are consistent with the elements in GALL AMP XI.M3.

The staff compared the elements in the applicant's program with the GALL Report program elements. The staff confirmed that the maximum reported ultimate tensile strength for the reactor head closure studs and nuts is 163.5 ksi, which is less than the 170 ksi specification cited in the GALL Report "scope of program" program element.

The staff noted that the applicant had indicated that the current scope of the program applies to the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda. The program description in the GALL AMP XI.M3 states that the GALL Report applies to inspection, repair, and replacement activities for ASME Code components covered in ASME Code Section XI, the 2001 Edition, inclusive of the 2003 Addenda. The staff noted that the applicant had clarified that the use of ASME Code Section XI, the 1998 Edition, inclusive of the 2000 Addenda, is consistent with the program description statement in the GALL AMP XI.M3 because the Statements of Consideration (SOC) on 10 CFR Part 54 clarifies that acceptable editions of the ASME Code Section XI are those up through the most recently endorsed edition of the Code mentioned in 10 CFR 50.55a. The staff verified that the SOC on 10 CFR Part 54 does include this clarification, and on that basis, the applicant's use of ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda, is consistent with the Code edition mentioned in the program description of GALL AMP XI.M3. Based on this review, the staff finds the applicant's crediting of the ASME Code Section XI, 1998 edition, inclusive of the 2000 Addenda (for aging management) is consistent with the criteria in GALL AMP XI.M3.

The staff confirmed that, in LRA Commitment No. 3, the applicant has committed to the ongoing implementation of the Reactor Head Closure Stud Program for aging management of those in-scope components that the AMP is credited. The staff also confirmed that the applicant has placed this commitment in LRA A.1.2.40 for the Reactor Head Closure Stud Program.

In comparing the seven program elements in the applicant's program to those in GALL AMP XI.M3, the staff noted that the program elements for which the applicant claimed consistency with the GALL Report were consistent with the corresponding program element criteria recommended in GALL AMP XI.M3. The "operating experience" program element is discussed separately below.

Operating Experience. The staff reviewed the applicant's OE described in the LRA Section B.2.3. The applicant stated that plant-specific OE did not reveal any degradation. The staff reviewed the OE reports provided in the LRA and in the plant basis documents, the staff confirmed that the plant-specific OE reviewed did not reveal any reactor head closure stud cracking or loss of material, or any other age related degradation with the RPV head studs, nuts, or washers.

The staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Reactor Head Closure Studs Program in LRA section A.1.2.40. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.1-2. 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).

The staff confirms that, in LRA Commitment No. 3, the applicant has committed to the ongoing implementation of the Reactor Head Closure Stud Program for aging management of those in-scope components for which the AMP is credited. The staff also confirms that the applicant has placed this commitment for the Reactor Head Closure Stud Program in LRA Section A.1.2.40.

Conclusion. On the basis of the review of the applicant's Reactor Head Closure Stud Aging Management 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.3 BWR Vessel Inside Diameter Attachment Welds Program

Summary of Technical Information in the Application. In LRA Section B.2.4, the applicant described the BWR Vessel ID Attachment Welds Program as an existing program that is consistent with GALL Report AMP XI.M4, "BWR Vessel ID Attachment Welds." The applicant stated that the program includes inspection and flaw evaluation, pursuant to the guidelines of the staff-approved Boiling Water Reactor Vessel and Internals Project (BWRVIP) report BWRVIP-48; and monitoring and control of reactor coolant water chemistry, pursuant to the guidelines of BWRVIP-29. The program helps to ensure the long-term integrity and safe operation of the vessel ID attachment welds.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff also conducted onsite interviews with the applicant to confirm these results.

The staff noted that the applicant's BWR Vessel ID Attachment Welds Program is based on the augmented inspection and flaw evaluation guideline criteria in Boiling Water Reactor Vessel and Internals Project (BWRVIP) Proprietary Topical Report No. TR-108724, "BWR Vessel and Internals Project, Vessel [Inner Diameter] ID Attachment Weld Inspection and Flaw Evaluation Guidelines (BWRVIP-48)." The staff approved the topical report to be credited for license renewal in a safety evaluation (SE) dated January 17, 2001. The approved version of the topical report is Topical Report BWRVIP-48-A.

In the SE on Topical Report BWRVIP-48-A, the staff issued three renewal applicant action items for BWR applicants crediting BWRVIP-48-A for aging management of reactor vessel (RV) ID attachment welds. The applicant provided the staff's renewal applicant action item descriptions and its responses to these actions items in LRA Appendix C, Table BWRVIP-48-A. The three action items follow:

(1) The staff's first renewal applicant action item required that applicants identify those guideline criteria aspects in BWRVIP-48-A that they might deviate from. The staff noted that the applicant would not deviate from the recommended inspection and flaw evaluation criteria provided in BWRVIP-48-A and; thus, determined that the applicant adequately addressed the staff's action item. Based on this review, the staff concludes that the applicant has adequately addressed the staff's first renewal applicant action item on BWRVIP-48-A. Therefore, this renewal applicant action item is resolved.

(2) The staff's second renewal applicant action item required that BWR applicants provide a UFSAR supplement summary description of the AMP based on the BWRVIP-48-A recommended criteria. The applicant stated that LRA Appendix A includes the UFSAR supplement for the BWR Vessel ID Attachment Welds Program. The staff confirms that the applicant has provided its UFSAR supplement summary description for the BWR Vessel ID Attachment Welds Program in LRA Section A.1.2.9. The staff's evaluation of the applicant's UFSAR supplement for this program follows later in this evaluation. Based on this review, the staff concludes that the applicant has adequately addressed the staff's second renewal applicant action item on BWRVIP-48-A. Therefore, this renewal applicant action item is resolved.

(3) The staff's third renewal applicant action item required that BWR applicants ensure that the inspection criteria in BWRVIP-48-A will not conflict with or result in changes to the plant's Technical Specifications (TSs). The applicant stated that its implementation of the inspection strategy in BWRVIP-48-A will not result in the need for any changes to the TS for either Unit 1 or Unit 2. The staff reviewed the TSs for Units 1 and 2 and confirms that, while the methods in BWRVIP-48-A may constitute alternative staff-approved inspection guidelines for the ASME Code Class 1 RV ID attachment welds, the TSs for Units 1 and 2 do not include any requirements to implement the ASME Code Section XI, Inservice Inspection (ISI) Programs requirements for the facility. The staff also confirms that the applicant's TSs center on operational-based, surveillance-based, and administrative control-based TS requirements and that the ISI Program and requirements are implemented through the applicant's ASME Code Section XI, ISI

Program, pursuant to 10 CFR 50.55a. Thus, based on this review, the staff concludes that the applicant has provided an adequate basis for concluding that its implementation of the guidelines in BWRVIP-48-A will not conflict with or result in any necessary changes in the TSs. Based on this review, the staff concludes that the applicant has adequately addressed the staff's third renewal applicant action item on BWRVIP-48-A. Therefore, this renewal applicant action item is resolved.

Based on its review, the staff finds the applicant's BWR Vessel Inside Diameter Attachment Welds Program consistent with the program elements of GALL AMP XI.M4 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE basis document for safety significant OE relevant to the aging management of BWR Vessel ID attachment weld components. The staff noted that the applicant only provided an overall OE summary statement in the "operating experience" program element for BWR Vessel ID Attachment Weld Program and did not provide any examples of SSES-specific or generic OE demonstrating that the AMP accomplishes its intended objective. However, the staff noted that the license renewal program basis document for the BWR Vessel ID Attachment Welds Program did include the ISI outage summary reports for the Units 1 and 2 refueling and inspection outages (1RIO13 and 2RIO11, respectively). The staff confirmed that, in these outage summaries, the applicant did not identify any recordable flaw indications resulting from its augmented inspections of the RV ID attachment welds.

Based on this review, the staff confirms that the applicant has been implementing the inspections of its RV ID attachment welds in accordance with the ISI requirements of the ASME Code Section XI, as modified by the recommended augmented inspection criteria in Topical Report No. BWRVIP-48-A and approved in the staff's SE on BWRVIP-48-A, dated January 17, 2001. The staff finds that the applicant's refueling outages (RFOs) and inspection reports (IRs) provide acceptable confirmation that currently there is no plant-specific OE for the RV ID attachment welds inspected during outages 1RIO13 and 2RIO12.

The staff confirms that the OE program element satisfies the criterion defined in the GALL Report and the guidance found in SRP LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided an UFSAR supplement for its BWR Vessel ID Attachment Welds Program in LRA Section A.1.2.9, Commitment No. 4. The staff confirms that the UFSAR supplement summary description for the BWR Vessel ID Attachment Welds Program conforms to the staff's recommended UFSAR supplement for these type of programs as described in SRP-LR Table 3.1-2. The staff also confirms that in UFSAR Supplement Table A-1, the applicant committed (Commitment No. 4) to ongoing implementation of its BWR Vessel ID Attachment Welds Program for aging management of those Units 1 and 2 in-scope components that the AMP is credited for. Further, the staff confirms that the applicant has linked this commitment to UFSAR Supplement A.1.2.9 for the BWR Vessel ID Attachment Welds Program. Based on this review, the staff finds that UFSAR Supplement A.1.2.9, when coupled to LRA Commitment No. 4, provides an acceptable UFSAR supplement summary description of the applicant's BWR Vessel ID Attachment Welds 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 the audit and review of the applicant's BWR Vessel ID Attachment

Welds Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.4 BWR Feedwater Nozzle Program

Summary of Technical Information in the Application. In LRA Section B.2.5, the applicant described the BWR Feedwater Nozzle Program as an existing program that is consistent with GALL Report AMP XI.M5, "BWR Feedwater Nozzle." The applicant stated that this program includes enhanced ISI pursuant to ASME Code Section XI, Subsection IWB, Table IWB 2500-1 and the recommendations of report GE-NE-523-A71-0594; and system modifications to mitigate cracking.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

In the "acceptance criteria" program element of the program basis document, the applicant stated that it may use acceptance criteria in staff-approved BWRVIP guideline documents as an alternative to the acceptance criteria for the FW nozzles required by the ASME Code Section XI, Subsection IWB. This is a similar statement to the one provided by the applicant in LRA B.2.1, "Inservice Inspection Program."

In RAI B.2.1-2, dated June 12, 2008, the staff requested that the applicant clarify whether proposals to use alternative BWRVIP guideline criteria in lieu of ASME Code Section XI requirements would be submitted for relief.

In its response to RAI B.2.1-2, dated July 14, 2008, the applicant stated that all proposals to use staff-approved BWRVIP guideline criteria in lieu of applicable ASME Code Section XI requirements will be submitted for staff approval as part of each 10-year ISI plan, pursuant to 10 CFR 50.55a. The staff noted that the applicant clarified that the use of the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda, is consistent with the program description statement in GALL AMP XI.M1 because the SOC on 10 CFR Part 54 clarifies that acceptable editions of the ASME Code Section XI are those acceptable endorsed editions of the ASME Code Section XI up through the most recently endorsed edition of the Code mentioned in 10 CFR 50.55a. The staff verified that the SOC on 10 CFR Part 54 does include this clarification, and that based on this clarification, use of the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda, is consistent with the Code edition mentioned in the program description of GALL AMP XI.M1. Based on this review, the staff finds the applicant's crediting of the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda (for aging management) is consistent with the criteria in GALL AMP XI.M1. The staff evaluated the applicant's response to this RAI in SER Section 3.0.3.2.1.

Based on the review, the staff finds the applicant's BWR Feedwater Nozzle Program consistent with the program elements of GALL AMP XI.M5 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE basis document for safety significant OE relevant to the aging management of FW nozzles. The staff noted that the applicant had conducted pre-service examinations of the six Unit 1 FW nozzles and inner radii were conducted and found no indications of cracking. Subsequent inspections of the Units 1 and 2 FW nozzles resulted in no recordable indications of cracking. The staff noted that the program basis document provided OE events resulting from augmented examinations that were performed on the FW nozzles during the last refueling and inspection outage for Unit 1. Specifically, the staff noted that the applicant's augmented ultrasonic testing (UT) examinations of Unit 1 FW nozzle N4A indicated the presence of eight recordable flaw indications that were dispositioned as acceptable for further service, pursuant to ASME Code Section XI, IWB-3000. However, the applicant did not cite these flaw indications as relevant OE for this AMP.

In RAI B.2.5-1, dated June 12, 2008, the staff requested that the applicant amend the "operating experience" program element for LRA Section B.2.5 to identify cracking of the Unit 1 N4A FW nozzle as relevant OE for the AMP and to explain in detail which augmented UT reinspection frequency the applicant will use in the future for the Unit 1 FW nozzle N4A.

In its response to RAI B.2.5-1, dated July 14, 2008, the applicant amended the "operating experience" program element to state that subsequent inspections of the Units 1 and 2 FW nozzles have resulted only in one recordable indication, and consistent with industry OE and corresponding staff-approved recommendations, the inspection frequency for the FW nozzles is once per 10-year interval. The applicant also provided the following OE:

> During the fourteenth Unit 1 refueling outage in March 2006, all critical regions of the six Unit 1 feedwater nozzles were ultrasonically (UT) inspected as part of the ISI Program. No recordable indications were detected in five of the six nozzles. The UT results for Nozzle N4A indicated one recordable flaw and seven other indications that were too small to characterize as flaws. The one recordable flaw was evaluated against the criteria in ASME Section XI Table IWB 3510-1. It was determined to be acceptable for continued service, since the flaw size was less than half of that allowed by IWB-3510. This flaw indication did not represent a noticeable change from the previous inspection results. Since the flaw indication is within the acceptance criterion established in ASME Section XI, no change in the inspection frequency for the N4A or any other feedwater nozzle at SSES is required by the ISI Program or ASME Section XI.
>
> During the thirteenth Unit 2 refueling outage in March 2007, all critical regions of the six Unit 2 feedwater nozzles were ultrasonically (UT) inspected as part of the ISI Program. No recordable indications were detected in any of the six nozzles.

Based on its review, the staff finds the applicant's response to RAI B.2.5-1 acceptable because the applicant has identified the flaw indications on the FW nozzle as part of its OE input, provided the inspection frequency, and provided the results of further inspections of the Unit 1 and 2 FW nozzles, which showed no recordable indications of cracking. Therefore, the staff's concern described in RAI B.2.5-1 is resolved.

The staff confirms that the OE program element satisfies the criterion defined in the GALL Report and the guidance found in SRP LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

<u>UFSAR Supplement</u>. The applicant provided the UFSAR supplement for its BWR Feedwater Nozzle Program in LRA Section A.1.2.6, Commitment No. 5. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in

SRP-LR Table 3.1-2. The staff also confirms that the applicant has committed to ongoing implementation of its BWR Feedwater Nozzle Program for aging management of those in-scope components for which the AMP is credited. Further, the staff confirms that the applicant has linked this commitment to UFSAR Supplement Section A.1.2.6 for the BWR Feedwater Nozzle Program.

The staff notes that the description for the applicant's BWR Feedwater Nozzle Program states that the UT methodology for the augmented inspections of the FW nozzles will be implemented in accordance with the recommendations of BWR Owners Group Topical Report No. GENE-523-71-0594. In contrast, the UFSAR supplement summary description for this AMP indicates that the augmented UT inspections of the nozzles will be implemented in accordance with the recommendations in applicable BWRVIP guidelines.

In RAI B.2.5-2, dated June 12, 2008, the staff requested that the applicant clarify which UT methodology would be used in the BWR Feedwater Nozzle Program.

In its response to RAI B.2.5-2, dated July 14, 2008, the applicant stated that the BWR Feedwater Nozzle Program is a part of the ISI Program. The applicant further stated that the ISI requirements for the FW nozzles comply with ASME Code Section XI, Subsection IWB, Table 2500-1, and staff-approved BWR Owners Group Topical Report, GENE-523-A71-0594, Revision 1, which provides guidance for inspecting the FW nozzle bore region using UT methodologies. The applicant also stated that this is consistent with GALL AMP XI.M5 and that its BWR Feedwater Nozzle Program is committed to following the GENE-523-A71-0594, Revision 1 guidelines, during the period of extended operation. The applicant amended the LRA to delete the references to BWRVIP guidelines from the LRA Section B.2.5 program description and from LRA Section A.1.2.6.

Based on its review, the staff finds the applicant's response to RAI B.2.5-2 acceptable because the applicant has sufficiently clarified that its ISI Program includes the BWR FW nozzles, and the applicant has committed to following the staff-approved GENE-523-A71-0594, Rev. 1 guidelines during the period of extended operation, which makes the program consistent with GALL AMP XI.M5. Therefore, the staff's concern described in RAI B.2.5-2 is resolved.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.6, as amended, and coupled to LRA Commitment No. 5, provides an acceptable UFSAR supplement summary description of the applicant's BWR Feedwater Nozzle Program because it is consistent with the UFSAR supplement summary guidance for BWR Feedwater Nozzle Programs in the SRP-LR.

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 the review of the applicant's BWR Feedwater Nozzle Program and the applicant's response to the staff's RAIs, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, as amended, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.5 BWR Stress Corrosion Cracking Program

Summary of Technical Information in the Application. In LRA Section B.2.7, the applicant described the BWR Stress Corrosion Cracking (SCC) Program as an existing program that is consistent with GALL AMP XI.M7, “BWR Stress Corrosion Cracking.” The applicant stated that the program includes preventive measures to mitigate intergranular stress corrosion cracking (IGSCC) and inspection and flaw evaluation to monitor IGSCC and its effects. The applicant also stated that the staff-approved Boiling Water Reactor Vessel and Internals Project (BWRVIP) report BWRVIP-75 allows for modifications of inspection scope in the Generic Letter (GL) 88-01 program.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

In comparing the elements in the applicant’s program to those in GALL AMP XI.M7, the staff noted that the program elements in the applicant’s AMP claim of consistency with the GALL Report were consistent with the corresponding program element criteria recommended in GALL AMP XI.M7, with the exception of two program element aspects identified below that the staff determined required additional clarification.

The staff noted in the program basis document that applicant’s “preventive actions” program element for the BWR Stress Corrosion Cracking Program indicated that two welds scheduled for stress relief had not received a post-weld heat treatment consistent with GL 88-01 and NUREG-0313 recommendations and were unacceptable for stress relief credit by the staff. The staff also noted that the applicant identified that the plant had initiated HWC control as a basis for reducing the electro-chemical potentials of the Class 1 stainless steel welds below the potential associated with the onset of SCC.

In RAI B.2.7-1, dated June 12, 2008, the staff requested that the applicant discuss whether there is any established link between the findings identified in the staff’s SE on the applicant's response to GL 88-01 and the circumferential SCC induced flaw indications detected in the Unit 1 N2J recirculation outlet nozzle safe-end weld and in the Unit 1 NIB recirculation inlet nozzle safe end weld. Specifically, the staff requested that the applicant identify whether these safe-end nozzle welds were among the Class 1 stainless steel piping welds scheduled for induction heat stress relief treatments and whether the N2J and NIB nozzle safe-end welds were the same welds that had not received the recommended post-weld heat treatments as part of this stress relief process. The staff further requested that the applicant identify the dates for initiation of HWC at Units 1 and 2.

In its response to RAI B.2.7-1, dated July 14, 2008, the applicant stated:

> The discussion in the license renewal basis document for the "preventive actions" program element for the BWR Stress Corrosion Cracking Program incorrectly stated that there are "two SI-treated welds that were not given post-weld heat treatment." The correct statement is that there are "two SI-treated welds that were not completely ultrasonically examined post-SI."
>
> The two welds in question are identified in the PPL letter to the NRC, PLA-3263, dated October 2, 1989, as DCA1081-FW-5 and DCA1102-FW-6. These welds are piping welds

on the Unit 1 Residual Heat Removal System, not the SSES Unit 1 NIB and N2J recirculation nozzle-safe end welds. And, these piping welds did, in fact, have the Induction Heating Stress Improvement Process (IHSI) performed within two years of commercial operation, consistent with the NRC Generic Letter (GL) 88-01/NUREG-0313 recommendations. However, the post-IHSI ultrasonic examination (UT) of the welds could not be performed, as required by NUREG-0313, due to the weld configuration. In PLA-3263, PPL classified these two welds as IGSCC Category G and committed to inspect the welds during the next refueling outage. In the NRC's SE on the SSES response to GL 88-01, it was the classification of these two welds as IGSCC Category G that the NRC found to be unacceptable. Subsequently, PPL inspected these welds during the Unit 1 [fifth] refueling outage in 1990, and the welds are now classified as IGSCC Category B. The Unit 1 N1B and N2J nozzle-safe end welds did not have IHSI within two years of commercial operation. As these are dissimilar metal welds, IHSI is not an appropriate stress improvement method. Instead, these welds had the Mechanical Stress Improvement Process (MSIP) applied after approximately ten years of commercial operation. There is no link between the findings identified in the NRC's SE on the PPL response to GL 88-01 and the flaw indications detected in the Unit 1 NIB and N2J recirculation nozzle safe-end welds.

The staff reviewed the applicant's response and determines that the two welds in question were on the residual heat removal (RHR) system and that those welds did receive the post-weld heat treatment. The staff further determines that the applicant's recirculation nozzle safe-end welds also received the post-weld heat treatment.

Based on its review, the staff finds the applicant's response to RAI B.2.7-1 acceptable because the applicant has adequately clarified that the welds in question have been post-weld heat treated, consistent with the GL 88-01 and NUREG-0313 recommendations, and have been appropriately classified and inspected. Therefore, the staff's concerns described in RAI B.2.7-1 are resolved.

The staff noted that staff-approved guidelines in BWRVIP Topical Report BWRVIP-75A provide the latest recommendations for augmented SCC ISIs. However, the staff noted that the applicant had only credited the BWRVIP-75A criteria for expansion of the sample size upon detection of a relevant SCC-induced flaw indication and that the applicant continued to use the recommended augmented ISI criteria in GL 88-01 and NUREG-0313 to perform the augmented ISI examinations (i.e., augmented UT examinations) of these stainless steel Class 1 pipe welds.

In RAI B.2.7-2, dated June 12, 2008, the staff requested that the applicant clarify whether the updated staff-approved guidelines in Topical Report BWRVIP-75A would be used as an option for performing other aspects of the augmented ISI Program for these ASME Code Class 1 stainless steel pipe welds; and whether the flaw acceptance criteria in staff-approved Topical Report BWRVIP-75A or Topical Report BWRVIP-14 will be used for the acceptance criteria of any crack indications that might be detected in these ASME Code Class I stainless steel pipe welds.

In its response to RAI B.2.7-2, dated July 14, 2008, the applicant stated that it does not use BWRVIP-75-A for flaw acceptance criteria, since the report contains no flaw acceptance criteria guidance. The applicant further stated that:

…flaw evaluation and acceptance criteria are in accordance with the ASME Code, Section XI, IWB-3640, as specified in NUREG-0313, Revision 2. PPL is committed to follow all requirements of NUREG-0313, Revision 2, except for the inspection criteria and schedule. The NRC-approved BWRVIP-14 addresses crack growth evaluation of flawed BWR shroud welds and other stainless steel internals. As part of the ASME Code flaw evaluation, a crack growth analysis is required. While PPL may use certain data and evaluation methods from BWRVIP-14 in a crack growth analysis, the evaluation and acceptance criteria will be in accordance with the ASME Code, Section XI, IWB-3640.

The staff reviewed BWRVIP-75-A, which provides the criteria and inspection schedule for different categories of welds. Because BWRVIP-75-A does not contain flaw acceptance criteria, the staff finds it acceptable to use ASME Code, Section XI, IWB-3640 for flaw evaluation and acceptance criteria, which includes the requirement of crack growth analysis because the components within the scope of this AMP are ASME Code Class 1 components. The ASME Code Section XI provides the necessary information to perform the crack growth analysis, which could be further supplemented by certain data and evaluation methods from BWRVIP-14.

Based on its review, the staff finds the applicant's response to RAI B.2.7-2 acceptable because the applicant has adequately explained why its does not use the BWRVIP-75-A as a basis for flaw acceptance, but, rather, ASME Code, Section XI, IWB-3640. Therefore, the staff's concern described in RAI B.2.7-2 is resolved.

Based on its review, the staff finds the applicant's BWR Stress Corrosion Cracking Program consistent with the program elements of GALL AMP XI.M7 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE described in the license renewal basis document for the BWR Stress Corrosion Cracking. The staff confirmed that the applicant appropriately identified the circumferential crack indications in the Unit 1 N2J recirculation nozzle outlet safe-end weld and the Unit 1 N1B recirculation inlet nozzle safe-end weld as relevant OE for this AMP. The staff also confirmed that the applicant implemented the inspections of these stainless steel welds through an augmentation of its ISI Program and that the applicant provided the condition reports (CRs) on these events in the license renewal basis binder for the AMP.

The staff noted that the applicant also listed a CR on flaw indications in 12 small-bore Class 1 piping components as relevant OE for this AMP. The staff reviewed these CRs as part of its onsite review of the AMP. The staff determined that the CRs demonstrated that the detection of these flaw indications were the result of the non-destructive test examinations implemented through an augmentation of the applicant's ISI Program, and that the CRs indicated that the applicant had performed appropriate Code repairs of the flaw indications in the small bore nozzle welds. Based on this review, the staff found that the applicant had taken appropriate actions to address these small bore Class 1 pipe flaw indications.

Based on this review, the staff finds that: (1) the listing of relevant OE for this AMP demonstrates that the applicant's BWR Stress Corrosion Cracking Program, as implemented through an augmentation of the applicant's ISI Program, achieves its objective of detecting relevant flaw indications (cracks) that may be induced by SCC, and (2) the applicant is taking appropriate corrective actions for recordable flaw indications detected through implementation of this program.

The staff confirms that the OE program element satisfies the criterion defined in the GALL Report and the guidance found in SRP LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement for the BWR Stress Corrosion Cracking Program in LRA Section A.1.2.8, Commitment No. 7. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.1-2. The staff also confirms that the applicant has committed (Commitment No. 7) in UFSAR Supplement Table A-1, to ongoing implementation of its BWR Stress Corrosion Cracking Program for aging management of those in-scope components for which the AMP is credited.

Based on this review, the staff finds that the UFSAR supplement summary description, when coupled with Commitment No. 7, provides an acceptable description of the applicant's BWR Stress Corrosion Cracking Program because it is consistent with UFSAR supplement summary description for Stress Corrosion Cracking Programs found in the SRP-LR.

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 review of the applicant's BWR Stress Corrosion Cracking Program and its responses to the staff's RAIs, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.6 Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

Summary of Technical Information in the Application. In LRA Section B.2.10, the applicant described the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as a new program that will be consistent with the program elements in GALL AMP XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel." The applicant stated that the program is credited to manage loss of fracture toughness in RV internal components that are fabricated from CASS.

Staff Evaluation. During the audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

In comparing the elements in the applicant's program to those in GALL AMP XI.M13, the staff noted that the program elements in the applicant's AMP claim of consistency with the GALL Report were consistent with the corresponding program element criteria recommended in GALL AMP XI.M13, with the exception of five program elements aspects identified below that the staff determined required additional clarification.

The "scope of program" program element for the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program, states that the CASS RV internal components will be screened for their susceptibility to loss of fracture toughness by thermal aging embrittlement and neutron irradiation embrittlement. However, the program element does not establish which staff-approved guideline(s) or basis document(s) will be used to screen the CASS RV internal components for susceptibility to these aging phenomena. Furthermore, the staff noted an inconsistency between the applicant's "scope of program" and the "parameters monitored/inspected" program element descriptions in the license renewal basis document for the AMP. The staff noted that the applicant did not identify and distinguish between the specific parameter criteria used to screen the CASS RV internal components for reduction of fracture toughness by thermal aging embrittlement and by neutron irradiation embrittlement.

In RAI B.2.10-1, dated June 12, 2008, 2008, the staff requested (part A) that the applicant clarify which staff-approved guidance or basis document it will use for susceptibility screening for loss of fracture toughness by thermal aging embrittlement and neutron irradiation embrittlement. The staff also requested (part B) that the applicant explain the discrepancy between the "scope of program" and the "parameters monitored/inspected" program elements for specific parameters used for susceptibility screening.

In its response to RAI B.2.10-1, part A, dated July 14, 2008, the applicant amended the LRA and revised the "scope of program" element to delete the specific parameters identified and instead added the staff-approved guideline that will be used for screening. The following statement was added to LRA Section B.2.10:

> Screening for thermal aging will be based on casting method, molybdenum content, and ferrite content, in accordance with the criteria found in the May 19, 2000, letter from Christopher Grimes (NRC) to D. J. Walters (NEI), "Thermal Aging Embrittlement of Cast Austenitic Steel Components," and in EPRI Technical Report 100976, "Evaluation of Thermal Aging Embrittlement for Cast Austenitic Steel Components," January 2001. Screening for neutron embrittlement will use the fluence threshold of IE+17 n/cm^2 (E>1Mev).

Similarly, in response to RAI B.2.10-1 part B, the applicant deleted the specific parameters from the "parameters monitored/inspected" element and instead added the following statement to LRA Section B.2.10:

> Those components screened as susceptible to Reduction of Fracture Toughness (either due to thermal aging or neutron embrittlement) will require inspection unless it is determined by component-specific evaluations that inspection is not required. The component specific evaluation will include a mechanical loading assessment to determine the maximum tensile loading on the component. If the loading is low enough to preclude fracture, then supplemental inspection of the component is not required.

Based on its review, the staff finds the applicant's response to RAI B.2.10-1 acceptable because the applicant has correctly identified the staff-approved document it will use for susceptibility screening, and has amended the "parameters monitored/inspected" program element in the LRA that identifies how susceptible components will be inspected. The staff determines that this action provides assurance that the applicant's program is consistent with GALL AMP XI.M13. Therefore, the staff's concern described in RAI B.2.10-1 is resolved.

The staff noted in the program basis document that the "detection of aging effects" program element indicates that the applicant may use UT as one of the inspection techniques to detect cracking in these CASS components. However, the current state-of-the-art UT inspection methods have not yet been qualified as being capable of detecting cracks in CASS materials.

In RAI B.2.10-2, dated June 12, 2008, the staff requested (part A) that the applicant clarify whether the state-of-the-art UT techniques are capable of detecting cracks in CASS materials, and; if not, verify the alternate inspection technique or method that will be implemented to monitor for cracking, if condition monitoring was chosen as the process for aging management of fracture toughness. The staff also requested (part B) that the applicant justify the basis for the "detection of aging effects" or "monitoring or trending" program elements for the AMP not crediting a supplemental flaw tolerance analysis as an alternative for managing reduction of fracture toughness in these CASS RV internal components.

In its response to RAI B.2.10-2, part A, dated July 14, 2008, the applicant acknowledged that it was not aware of any staff-approved UT techniques for detecting cracking in CASS components. The applicant stated that the statements made in the LRA were intended to preserve the option to include new examination techniques, such as UT, only if they are developed and approved in the future. The applicant further stated that at present, the enhanced visual examination (EVT-1) is the only staff-approved inspection technique, as recommended by GALL AMP XI.M13. The staff confirms that the applicant has revised the "detection of aging effects" program element to delete the phrase "including visual, ultrasonic, and surface techniques," and replaced it with "enhanced visual."

In response to part B, the applicant stated that it did not credit a supplemental flaw tolerance evaluation because the CASS RV internals covered by this program are not reactor coolant pressure boundary (RCPB) components; consequently, a classic critical flaw size analysis is not directly applicable. Once the susceptible components are identified, the applicant may perform a component-specific evaluation as discussed in the "detection of aging effects" program element in GALL AMP XI.M13. The staff confirms that the applicant has amended the LRA to include a statement in the "detection of aging effects" program element that for those components screened as susceptible to reduction of fracture toughness that a component-specific evaluation may be performed to determine whether supplemental inspection of the component is required, as discussed under the "parameters monitored or inspected" program element.

Based on its review, the staff finds the applicant's response to RAI B.2.10-2 acceptable because the applicant has adequately justified an alternate basis for managing the aging effects by performing component-specific evaluation supplemental evaluation when required. Additionally, the staff finds the applicant's response acceptable because the applicant has confirmed that it will perform enhanced visual technique examinations, by qualified personnel, consistent with the recommendations provided in the GALL Report, following procedures pursuant to ASME Code Section XI and 10 CFR Part 50, Appendix B. The staff determines that the applicant will employ these alternate methods, if, based on screening, the material is deemed susceptible and the aging effect is managed by inspection of the component. Therefore, the staff's concerns described in RAI B.2.10-2 are resolved.

The staff noted that the BWRVIP in the "scope of program" program element states (in part) that the program is credited for limited management of loss of material and reduction of fracture toughness in the RV internal components at SSES.

In RAI B.2.10-3, dated June 12, 2008, the staff requested that the applicant clarify whether it is crediting the BWRVIP as a option for managing reduction of fracture toughness in CASS RV internal components and; if so, identify the BWRVIP as an exception to the CASS Program, identify the staff-approved BWRVIP-based guideline reports that will be credited and used, and revise the UFSAR supplement, accordingly.

In its response to RAI B.2.10-3, dated July 14, 2008, the applicant clarified that as shown in LRA Table 3.1.2-2, the BWRVIP is credited for managing reduction of fracture toughness for components made of either stainless steel (non-cast) or nickel-based alloy. The applicant also stated that the BWRVIP is not credited for managing reduction of fracture toughness for any CASS RV internal components. The applicant further stated that as shown in LRA Table 3.1.2-2, the Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is credited for managing reduction of fracture toughness for all CASS RV internals and; therefore, there is no exception to GALL AMP XI.M13.

The staff reviewed LRA Table 3.1.2-2 for CASS components and noted that applicant has credited the Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program to manage the aging effect of reduction of fracture toughness for all CASS RV internal components. The staff also confirmed that the non-CASS internal components are managed by the BWRVIP.

Based on its review, the staff finds the applicant's response to RAI B.2.10-3 acceptable because the applicant has adequately clarified that the BWRVIP is credited for managing reduction of fracture toughness for components made of either stainless steel (non-cast) or nickel-based alloy, only. Therefore, the staff's concern described in RAI B.2.10-3 is resolved.

Based on its review, the staff finds the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program consistent with the program elements of GALL AMP XI.M13 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE described in the license renewal basis document for the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program. The applicant has identified the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as a new program for Units 1 and 2, and did not report any OE events on reduction of fracture toughness in CASS RV internal components as being relevant to the "operating experience" program element for the AMP. However, for this program, and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued a generic RAI.

In RAI B.2-1, dated June 10, 2008, the staff requested that the applicant commit to provide documentation of plant-specific OE for staff review after the program has been implemented, but, prior to entering the period of extended operation.

In its response to RAI B.2.1, dated July 8, 2008, the applicant stated that OE will be gained for new AMPs described in LRA Appendix B as these programs are implemented during the period of extended operation. The applicant stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, Quality Assurance Program. Results will be subject to staff review during regional inspections, under existing staff inspection modules. Test and inspection results that do not meet acceptance criteria will be evaluated under the Units 1 and 2 Corrective Action Program, which includes requirements to identify appropriate corrective actions and verify the effectiveness of those actions. Items entered into the SSES Corrective Action Program are available for review by the NRC Resident Inspector.

The staff noted the applicant's statement that inspection methods will be consistent with industry practices and are consistent with the “operating experience” program element for GALL AMP XI.M13. The staff also noted that regional staff site-inspections provide an opportunity for staff review and assessment of the effectiveness of the applicant’s Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program, after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on internal and external plant OE, will capture OE to support the conclusion that the effects of aging are adequately managed. On this basis, the staff finds this program element acceptable and concludes that a separate commitment is not necessary.

The staff confirms that the OE program element satisfies the criterion defined in the GALL Report and the guidance found in SRP LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program in LRA Section A.1.2.48, Commitment No. 10. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.1-2. The staff also confirms that the applicant has committed to implement the new Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program prior to entering the period of extended operation.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.48, when coupled with Commitment No. 10, provides an acceptable UFSAR supplement summary description of the applicant’s Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program because it is consistent with the guidance in the SRP-LR for Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Programs.

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 review of the applicant’s Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program and the applicant’s response to the staff’s RAIs, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and, therefore, is acceptable.

3.0.3.1.7 Flow-Accelerated Corrosion (FAC) Program

Summary of Technical Information in the Application. In LRA Section B.2.11, the applicant described the Flow-Accelerated Corrosion Program as an existing program that is consistent with the GALL Report AMP XI.M17, “Flow-Accelerated Corrosion.” The applicant stated that this program follows the guidance and recommendations of EPRI Nuclear Safety Analysis Center (NSAC)-202L and combines the elements of predictive analysis, inspections (to baseline and monitor wall thinning), industry experience, station information gathering and communication, and engineering judgment to monitor and predict FAC wear rates.

Staff Evaluation. During its audit the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

The staff reviewed the applicant's license renewal basis document and confirmed that the program scope includes the systems and components that could be affected by FAC. In comparing the elements in the applicant's program to those in GALL AMP XI.M17, the staff noted that the program elements in the applicant's AMP claiming consistency with the GALL Report were consistent with the corresponding program element criteria recommended in GALL AMP XI.M17, with the exception of two program element aspects identified below that the staff determined required additional clarification.

In the "scope of program" program element, the applicant identified the systems and components within the scope of this program. However, the staff noted that the carbon steel condensers (shell) from LRA Table 3.4.2-4, the condenser and air removal system; the carbon steel turbine casings from LRA Table 3.4.2-7, and the main turbine system were not included in the program element, "scope of the program." The staff further noted that the FAC Program is credited to manage the aging effect for both of these components in LRA Table 3.4.2-4 and 3.4.2-7.

In RAI B.2.11-1, dated May 30, 2008, the staff requested that the applicant confirm that these components are included in the scope of the existing FAC Program and; if not, justify why LRA Section B.2.11 is not enhanced to include these components.

In its response to RAI B.2.11-1, dated June 30, 2008, the applicant stated that the condenser and air removal system and the main turbine system are included in the scope of license renewal because they are non-related safety systems impacting safety-related systems. The condenser shell was credited as the anchor for the safety-related piping and provided a structural integrity function. However, the applicant stated that another anchor has been identified for this pipe line before it reaches the condenser. The staff determined that with the elimination of the structural integrity function, there are no aging effects that require management for the condenser shell, and the FAC Program need not be credited. Therefore, the applicant revised LRA Tables 2.3.4-4, 3.4.1, and 3.4.2-4 to remove the condenser shell from the scope of license renewal.

The applicant stated the main turbine continues to be credited for structural integrity. However, since the main turbine is not within the scope of the current FAC Program, the applicant proposes to use a plant-specific program to manage loss of material due to FAC for the HP turbine. The "Preventive Maintenance Activities – Main Turbine Casing Program" is an existing plant-specific program proposed by the applicant. The staff's evaluation of this program is documented in SER Section 3.0.3.3.4.

The staff reviewed the applicant's response and concludes that because the applicant proposes a plant-specific program to manage the aging effect of loss of material due to FAC, the staff finds it acceptable that the applicant does not include the main turbine casing in the scope of the Flow-Accelerated Corrosion Program.

Based on its review, the staff finds the applicant's response to RAI B.2.11-1 acceptable because the applicant has verified and the staff confirms that the condenser shell is no longer used for structural integrity to support a safety-related system and as a result, need not be within the scope of license renewal. The staff also confirms that the applicant has revised the appropriate LRA tables to remove the condenser shell from the scope of license renewal.

Therefore, the staff's concern described in RAI B.2.11-1 is resolved.

In the "monitoring and trending" program element, it was not clear to the staff what criterion the applicant used to increase sample size. GALL AMP XI.M17 states that inspection results are evaluated to determine whether additional inspections are needed to assure that the extent of wall thinning is adequately determined.

In RAI B.2.11-2, dated May 30, 2008, the staff requested that the applicant explain how it expands sample size and what acceptance criterion is used for sample expansion.

In its response to RAI B.2.11-2, dated June 30, 2008, the applicant stated that the FAC Program procedure requires an inspection sample expansion "if the remaining life of an inspected component cannot be calculated to be at least one operating cycle." The applicant further stated that the remaining life calculation is based on the measured component wall thickness and the calculated wear rate. The applicant also stated that this procedure provides additional guidance when the remaining life is adequate for another operating cycle, but inspection results are other than what was expected. The applicant indicated that expanded sample inspections are specified to capture locations with the highest probability of significant wear. The applicant noted that this guidance is consistent with EPRI NSAC-202L, and requires an updated FAC analysis and additional inspections, as appropriate, if inspection results are unexpected and inconsistent with predictions.

Based on its review, the staff finds the applicant's response to RAI B.2.11-2 acceptable because the applicant has adequately explained how it expands sample size and what acceptance criterion is used for sample expansion.

The staff concludes that because this guidance ensures that if unexpected results occur, a review of the systems is performed, and sample expansion is considered to capture the locations with the highest probability of significant wear. Therefore, the staff's concern described in RAI B.2.11-2 is resolved.

Based on its review, the staff finds the applicant's FAC Program consistent with the program elements of GALL AMP XI.M17 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B2.11 and interviewed the applicant's technical personnel to confirm that the plant-specific OE did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific OE have been reviewed by the applicant and are evaluated in the GALL Report.

The staff also reviewed the applicant's "operating experience" discussion provided in the applicant's license renewal basis document for the FAC Program. The staff reviewed a sample of condition reports and confirmed that the applicant has identified FAC and implemented appropriate corrective actions. The staff noted that in the last Unit 1 and Unit 2 outages, over 120 locations in each unit were inspected and eleven additional examinations in each unit were performed as expanded scope. The applicant identified planned replacements and performed emergent replacements. The staff reviewed the results of the outages for Units 1 and 2 and confirmed that appropriate corrective actions were implemented.

Furthermore, the staff confirmed that the applicant has addressed OE identified after the issuance of the GALL Report. The staff finds that the applicant's FAC Program, with the corrective actions discussed in the LRA, has been effective in identifying, monitoring, and correcting the effects of FAC and can be expected to ensure that piping wall thickness will be maintained above the minimum required by design.

The staff confirms that the OE program element satisfies the criterion described in the GALL Report and the guidance found in SRP LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement for the FAC Program in LRA Section A1.2.20, Commitment No. 11. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.4-2. The staff confirms that the applicant has committed to implement the FAC Program through the period of extended operation.

Based on this review, the staff determines that UFSAR Supplement Section A1.2.20 provides an acceptable UFSAR supplement summary description of the applicant's FAC Program because it is consistent with the UFSAR supplement summary description for FAC Program in the SRP-LR.

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 review of the applicant's FAC Program and the applicant's response to the staff's RAIs, 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) and; therefore, is acceptable.

3.0.3.1.8 Crane Inspection Program

Summary of Technical Information in the Application. In LRA Section B.2.15, the applicant described the existing Crane Inspection Program as consistent with GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The Crane Inspection Program manages the effects of general corrosion on the crane and trolley structural components for those cranes that are within the scope of 10 CFR 54.4, and the effects of wear on the rails in the rail system. The program utilizes guidance found in American National Standards Institute (ANSI) B30.2 "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)", ANSI B30.11 "Monorails and Underhung Cranes", and ANSI B30.16 "Overhead Hoists (Underhung)."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

In RAI B.2.15-1, dated June 30, 2008 the staff requested that the applicant explain the scope of its Crane Inspection Program. In comparing the elements in the applicant's program to those in GALL AMP XI.M23, the staff found that the applicant did not explicitly identify "the effects of wear on the rails in the rail system" in their basis document for the program element, "scope of program." It was unclear to the staff whether this item should have been identified as an exception.

In its response to RAI B.2.15-1, dated July 28, 2008, the applicant stated that although "the effects of wear on the rails in the rail system" was not explicitly identified in the program basis documents, it is indeed an aging effect which is managed by the Crane Inspection Program. The staff confirms that the applicant has revised LRA Section B.2.15 to clarify the intent of the program to specifically include wear of the crane rails.

Based on its review, the staff finds the applicant's response to RAI B.2.15-1 acceptable because the applicant has clarified that "the effects of wear on the rails in the rail system" is an aging effect which is managed by the Crane Inspection Program and has revised the LRA to clarify the intent of this AMP. Therefore, the staff's concern described in RAI B.2.15-1 is resolved.

Similarly, the staff found that the applicant did not explicitly identify "wear" in its basis document for the GALL report program element, "acceptance criteria." It is unclear to the staff whether this item should have been identified as an exception.

In RAI B.2.15-2, dated June 30, 2008, the staff requested that the applicant further explain the scope its Crane Inspection Program.

In its response to RAI B.2.15-2, dated July 28, 2008, the applicant stated that although wear of the crane rails was not explicitly identified in the GALL Report acceptance criteria program element, it is indeed an aging effect which is managed by the Crane Inspection Program. The staff confirms that the applicant has also revised LRA Section B.2.15, Crane Inspection Program to clarify the intent of the program to specifically include wear of the crane rails.

Based on its review, the staff finds the applicant's response to RAI B.2.15-2 acceptable because the applicant has clarified that "wear" is an aging effect which is managed by the SSES Crane Inspection Program and has revised the LRA to clarify the intent of this AMP. Therefore, the staff's concern described in RAI B.2.15-2 is resolved.

On the basis of its onsite review and discussions with the applicant, the staff determined that the applicant's Crane Inspection Program is implemented through SSES's procedures based on staff-approved guidance. Inspections to detect degradation are visual in nature, and are conducted on a routine basis, which include annual inspections for the reactor building crane and refueling platform, and bi-annual inspections for the diesel generator bridge cranes. In addition, the staff noted, through review of station procedures, that some more infrequently used cranes are inspected either every two years or prior to use.

In comparing the seven program elements in the applicant's program, the staff finds that the applicant has addressed the elements in a satisfactory manner. Furthermore, the staff finds that these elements were consistent with GALL AMP XI.M23.

<u>Operating Experience</u>. The staff also reviewed the applicant's OE described in LRA Section B.2.15. The applicant stated that "Related crane/hoist inspections have found no age-related degradation problems." Through the review of OE reports, including a sample of condition reports and interviews of the applicant's technical staff, the staff confirmed that the plant-specific OE did not reveal any degradation not bounded by industry experience. During an onsite audit review of plant-specific documentation, the staff found that in 2007, a crack was

detected in a structural load-bearing weld. This incident was not reported in the LRA OE summary. The staff determined more information was needed to assess the severity of the incident.

In RAI B.2.15-3, dated June 30, 2008, the staff requested that the applicant provide a detailed explanation on the 2007 crane incident.

In its response to RAI B.2.15-3, dated July 28, 2008, the applicant stated that follow up corrective actions were completed in a timely manner to adequately address the issue. These actions included inspection of the weld, an engineering evaluation, consultation with the crane vendor's engineer, repair of the weld, load testing, and finally a re-inspection. The applicant returned the crane to service after it had determined that all tests were satisfactory. The staff determined that the crack in a structural load-bearing weld is OE already bounded by industry experience, and was properly addressed by the applicant's aging management program.

Based on its review, the staff finds the applicant's response to RAI B.2.15-3 acceptable because the applicant has provided a satisfactory explanation of the incident involving a crack detected in a structural load-bearing weld and the corrective actions taken to address the issue. Therefore, the staff's concern described in RAI B.2.15-3 is resolved.

The staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement for the Crane Inspection Program in LRA section A.1.2.17, Commitment No. 14. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.3-2.

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).

The staff confirmed that the applicant has committed to the ongoing implementation of the Crane Inspection Program for aging management of those in-scope components for which the AMP is credited. The staff also confirmed that the applicant has placed this commitment for the Crane Inspection Program in UFSAR Supplement Summary Section A.1.2.17.

Conclusion. On the basis of its review of the applicant's Crane Inspection Aging Management Program, as well as the applicant's RAI responses, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging on crane and trolley structural components for those cranes within the scope of 10 CFR 54.4, and the effects of wear on the rails in the rail system will be adequately managed so that the intended functions of these components 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) and; therefore, is acceptable.

3.0.3.1.9 Condensate and Refueling Water Storage Tanks Inspection Program

Summary of Technical Information in the Application. In LRA B2.19, the applicant described the Condensate and Refueling Water Storage Inspections Program as a new one-time inspection that, in conjunction with the Systems Walkdown Program, will be consistent with the GALL AMP XI.M29, "Aboveground Steel Tanks."

The applicant stated that this program, in conjunction with the Systems Walkdown Program, includes the inspection of the condensate storage tank (CST) and refueling water storage tank (RWST) inaccessible surfaces (i.e. tank bottoms) and accessible external surfaces. Furthermore, the applicant stated that this program includes volumetric and/or visual inspections that will be used to provide an indication of loss of material due to crevice, general or pitting corrosion that has occurred or may likely occur.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's AMP evaluation for the Condensate and Refueling Water Storage Tanks Inspection Program, together with the applicant's program basis documents. The applicant claims that the Condensate and Refueling Water Storage Tanks Inspection Program, in conjunction with the Systems Walkdown Program, will be consistent with GALL AMP XI.M29.

In comparing the seven program elements in the applicant's program to those in GALL AMP XI.M29, the staff noted that the applicant claimed that the program elements in the applicant's AMP were consistent with the GALL Report. However the staff required additional information to complete its review of two program elements; "scope of program" and "acceptance criteria."

The staff further noted that, based on GALL AMP XI.M29, paints, coatings, sealants and caulking are to be monitored for degradation. In the Condensate and Refueling Water Storage Tanks Inspection Program, the applicant stated that these materials will be monitored under the Systems Walkdown Program. Upon review of the Systems Walkdown Program basis documents, the staff noted that these materials were not included in the scope of program for this AMP.

In RAI B.2.19-1, dated June 13, 2008, the staff requested that the applicant explain the basis for not scoping in paints, coatings, sealants and caulking as materials that should be monitored for degradation, in either the Condensate and Refueling Water Storage Tanks Inspection Program or the Systems Walkdown Program. The staff also requested that the applicant explain the method in which the applicant will visually inspect these materials under the Systems Walkdown Program.

In its response to RAI B.2.19-1, dated July 24, 2008, the applicant stated that one exception was taken which affects the "scope of program," "preventative actions," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements. The "operating experience" program element is discussed separately below.

The staff noted in the applicant's response to RAI B.2.19-1, dated July 24, 2008, that the applicant has taken an exception to GALL XI.M29 for the "scope of program," "preventative actions," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements. The staff evaluation of this exception follows.

Based on GALL AMP XI.29, the staff determined that corrective actions are initiated upon the detection of any degradation of paints, coatings, sealants and caulking. However, the staff noted that in the applicant's Condensate and Refueling Water Storage Tanks Inspection Program and the Systems Walkdown Program, the corresponding program element “acceptance criteria” states that there shall be no unacceptable loss of material.

In RAI B.2.19-2, dated June 13, 2008, the staff requested that the applicant explain the discrepancy between the GALL AMP XI.M29 and the applicant’s Condensate and Refueling Water Storage Tanks Inspection Program and the Systems Walkdown Program and; justify its basis for taking actions only upon the detection of an unacceptable loss of material. Additionally, the staff requested that the applicant explain why the program element for the Condensate and Refueling Water Storage Tanks Inspection Program and Systems Walkdown Program differs from GALL AMP XI.M29.

In its response to RAI B.2.19-2, dated July 24, 2008, the applicant stated that it has clarified and amended LRA Section B.2.19 to state that any indications of loss of material detected during the inspection of the tank bottoms will be reported and evaluated. The staff confirmed that the applicant has amended LRA Section B.2.19 to state that the results of the volumetric test performed on the tank bottom will be evaluated against the design thickness, and any indication of loss of material will be reported through the corrective actions process and then evaluated against the design corrosion allowance. The staff also confirmed that the applicant had amended LRA Section B.2.19 to state that indications of corrosion on the accessible external surface of the tanks will be reported and will require further evaluation.

Based on its review, the staff finds the applicant’s response acceptable because the applicant has amended LRA Section B.2.19 to state that any indication of degradation on the tanks bottoms and corrosion on the accessible external surfaces will be reported and evaluated, consistent with recommendations in GALL AMP XI.M29. Therefore, the staff’s concerns described in RAI B.2.19-2 are resolved.

<u>Exception 1</u>

Based on the applicant’s response to RAI B.2.19-1, the following exception was taken which affects the “scope of program,” “preventative actions,” “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements:

> Coatings of the tanks surfaces are not credited for preventing corrosion. The coatings do not perform an intended function for license renewal, aging management is not required, and degradation is not reported.
>
> Sealants at the interface between the tanks and the concrete pedestal is evaluated as a structural commodity and is not within the scope of the Condensate and Refueling Water Storage Tanks Inspection.

The staff noted in the applicant’s response to RAI B.2.19-1, dated July 24, 2008, that the applicant does not credit paints and coating for prevention and mitigation of corrosion on the external surfaces of the CST and RWST. The staff further noted that since paints, coatings, sealants and caulking are not credited for aging management as part of license renewal, the applicant is not required to manage aging effects that may affect paints, coating, sealants and caulking as part of the Systems Walkdown Program. However, the applicant stated that caulking and sealants will be inspected by the Structures Monitoring Program. The staff confirms that the scope of the applicant’s Structures Monitoring Program includes the CST and RWST and inspection of the associated caulking and sealants at the foundation and support pedestals. The staff notes that visual inspections of the condition of paints and coatings on the external surfaces of the CST and RWST will indicate whether degradation and corrosion is occurring on the underlying material, even though paints and coatings are not credited.

Based on its review, the staff finds the applicant's response to RAI B.2.19-1 acceptable because: (a) the applicant has not credited paints and coatings with preventing and mitigating aging of the underlying materials, and therefore does not require aging management; (b) the applicant will perform periodic visual inspections of the external surfaces of the tanks to determine the condition of the underlying metallic material; and (c) the staff confirmed that sealants and caulking are inspected and monitored by the applicant's Structures Monitoring Program. Therefore, the staff's concern described in RAI B.2.19-1 is resolved.

The staff finds the applicant's exception acceptable because the applicant will perform its periodic visual inspections of the external surfaces of the CST and RWST for indications of corrosion of the underlying material, and the staff has confirmed that the applicant will inspect and monitor sealants and caulking by the Structures Monitoring Program.

Operating Experience. The staff reviewed the applicant's OE described in the license renewal basis document for the Condensate and Refueling Water Storage Tanks Inspection Program. The applicant stated that the Condensate and Refueling Water Storage Tanks Inspection Program is a new one-time inspection activity for which there is no OE and that inspection methods will be consistent with accepted industry practices. For this program and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued a generic RAI.

In RAI B.2.1, dated June 10, 2008, the staff requested that the applicant commit to provide documentation of plant-specific OE, for staff review, after the program has been implemented, but prior to entering the period of extended operation.

In its response to RAI B.2.1, dated July 8, 2008, the applicant stated that OE for new AMPs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant further stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, Quality Assurance Program and that results will be subject to staff review during regional inspections under existing staff inspection modules. The applicant also stated that it will perform one-time inspections, prior to entry to the period of extended operation, to confirm the effectiveness of existing AMPs, and that these programs are subject to review under NRC Inspection Procedure 71003, "Post-Approval Site Inspection for License Renewal."

The staff notes that the applicant's statement that inspection methods will be consistent with industry practices is consistent with the "operating experience" program element for GALL AMP XI.M29. The staff also notes that post-approval site inspections provide an opportunity for staff review and assess the effectiveness of the applicant's Condensate and Refueling Water Storage Tanks Inspection Program, after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on industry and plant-specific OE, will capture future OE to support the conclusion that the effects of aging are adequately managed.

During its review, the staff noted that even though the applicant states OE does not currently exist for this program, the applicant reviewed its CRs Database for indications of degradation of the CSTs and RWSTs and did not find any indications. During its onsite review, the staff reviewed the CRs for the Systems Walkdown Program provided in the license renewal basis documents, in order to determine whether there have been indications of degradation to the protective coatings, sealants, caulking and tank bottoms of the CSTs and RWSTs. Based on its review, the staff did not identify any CRs related of the degradation to the protective coatings, sealants, caulking and tank bottoms of the CSTs and RWSTs.

On this basis, the staff confirms that the “operating experience” program element satisfies the criterion defined in the GALL Report and the guidance in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable and concludes that a separate commitment is not necessary.

The staff reviewed this section and finds it acceptable because it is consistent with the corresponding description in SRP-LR Table 3.3-2 and because the summary description includes the bases for determining that aging effects will be managed.

The staff determines that the UFSAR supplement for this AMP 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 Condensate and Refueling Water Storage Tanks Inspection Program and the applicant’s responses to the RAIs, the staff finds all program elements consistent with the GALL Report. In addition, the staff reviewed the exception and its justification and determines that the AMP, with the exception, is adequate to manage the aging effects for which its 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), and; therefore, is acceptable.

3.0.3.1.10 Chemistry Program Effectiveness Inspection

Summary of Technical Information in the Application. In LRA Section B.2.22, the applicant described the new Chemistry Program Effectiveness Inspection as consistent with GALL AMP XI.M32, “One-Time Inspection.” The applicant stated that the program is a one-time inspection program to detect and characterize the condition of materials in representative low-flow and stagnant areas of plant systems influenced by the BWR Water Chemistry Program, the Closed Cooling Water Chemistry Program, and the Fuel Oil Chemistry Program, all of which are mitigation programs. The applicant also stated that the inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, general, or pitting corrosion and to microbiologically influenced corrosion (MIC) in fuel oil, as well as cracking due to SCC of susceptible materials in susceptible locations has occurred. The applicant further stated that implementation of the program (Commitment No. 19), which is scheduled to be completed during the 10-year period prior to the period of extended operation, will provide confirmation of chemistry program effectiveness and assure that the integrity of susceptible components is maintained consistent with the CLB during the period of extended operation.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff reviewed the applicant’s AMP evaluation for the Chemistry Program Effectiveness Inspection, together with the applicant’s program outline which provides specific guidance for preparation of implementing procedures related to this new program. The staff noted the program elements in the AMP that the applicant claimed were consistent with the GALL Report are consistent with GALL AMP XI.M32, with the exception of two program element aspects for which the staff required additional information.

The staff noted that the applicant's description of the "monitoring and trending" program element for the Chemistry Program Effectiveness Inspection refers to using engineering evaluations to determine sample size and inspection locations, but provides no details of the methodology to be used.

In RAI B.2.22-1, dated June 23, 2008, the staff requested that the applicant describe the methodology it will use to select sample sizes and sample locations for various components and also explain what methodology or basis will be used for sample size expansion, if unanticipated aging effects are found.

In its response to RAI B.2.22-1, dated July 17, 2008, the applicant stated the following:

> The sample population will be selected such that it is representative of each material and environment combination within the scope of the inspection. Consideration will be given in the sample selection to the variations among the treated water environments that could affect the potential for aging effects to occur. Each material type exposed to fuel oil will also be included in the sample population. The sample selection will focus on those locations determined to be subject to low flow or stagnant conditions, as these locations are expected to be the most likely to first experience the effects of degradation should it be evidenced. Identification of the inspection locations will be based on engineering knowledge of the system(s), supported by walkdowns of the systems as necessary, including the time in service and severity of operating condition. The inspection will focus on those systems, or portions of systems, most subject to stagnant or low flow condition.
>
> The results of the inspection of the sample population will be reviewed for any evidence of degradation. If degradation is detected the results will be entered into the SSES corrective action program. The corrective action program requires evaluation of the extent of the degradation, the effect on the component intended function, and the necessary corrective actions. The need to perform inspections of a larger portion of the total population of components within the scope of the activity will also be considered.

The staff confirms that the applicant has amended LRA Section B.2.22 and revised the second paragraph in the discussion of "monitoring and trending" to read as follows:

> Sample size will be determined by engineering evaluation, as described for the "detection of aging effects" program element above. Unacceptable inspection findings will be evaluated using the SSES corrective action process. The evaluation done under the SSES corrective action program will identify appropriate corrective actions including the need to perform additional inspections.

In evaluating the applicant's response, the staff noted that the applicant provided additional qualitative information with regard to the methodology it used to select sample sizes and locations. The applicant also provided a link between its corrective action program and its methodology and basis for sample size expansion. The staff noted that the additional information provided by the applicant with regard to the "monitoring and trending" program element is at a level of detail consistent with the description of this program element in GALL AMP XI.M32.

Based on its review, the staff finds the applicant's response to RAI B.2.22-1 acceptable because the applicant has provided an adequate description of its Chemistry Program Effectiveness Inspection which is consistent with the program element as described in the GALL Report. Therefore, the staff's concern described in RAI B.2.22-1 is resolved.

The staff noted that the applicant's description of the "acceptance criteria" program element for the Chemistry Program Effectiveness Inspection states that there shall be "no unacceptable loss of material, or cracking of stainless steel exposed to temperatures above 140ºF, that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation." However, the "acceptance criteria" program element in the GALL Report states that any indication or relevant conditions of degradation detected are to be evaluated.

In RAI B.2.22-2, dated July 17, 2008, the staff requested that the applicant explain why the acceptance criteria in the applicant's program is different from the recommendation in the GALL Report and clarify what is meant by "no unacceptable loss of material or cracking," as used in the acceptance criteria for the applicant's program.

In its response to RAI B.2.22-2, dated July 17, 2008, the applicant stated the following:

> Any indications or relevant conditions of degradation detected during the inspections will be evaluated. Similar to the example provided in the GALL text, the inspection observations will be compared to predetermined acceptance criteria. Inspection results that do not meet the acceptance criteria will be entered into the corrective action program for evaluation.

The staff confirms that the applicant has amended LRA B.2.22 to provide consistency with the description of the "acceptance criteria" program element in GALL AMP XI.M32 and has revised the text to read as follows:

> Any indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications/conditions will be evaluated under the SSES corrective action program to determine whether they could result in a loss of component intended function during the period of extended operation.

In evaluating the applicant's response, the staff notes that that the applicant's revision to the LRA brings its description for the "acceptance criteria" in the Chemical Program Effectiveness Inspection into conformance with the "acceptance criteria" program element in GALL AMP XI.M32.

Based on its review, the staff finds the applicant's response to RAI B.2.22-2 acceptable because the applicant has adequately explained the basis for why the acceptance criteria in the Chemistry Program Effectiveness Inspection differs from the recommendation in the GALL Report and has revised the LRA to correct the discrepancy. The staff determines that with this revision, the "acceptance criteria" program element of the applicant's program is consistent with the same program element in the GALL Report. Therefore, the staff concern described in RAI B.2.22-2 is resolved.

In a letter dated December 11, 2008, the applicant amended the description of the Chemical Program Effectiveness Inspection in LRA Section B.2.22. The applicant revised the “scope of program” description to state that the Chemical Program Effectiveness Inspection includes the surfaces of nickel-alloy components, in addition to aluminum, copper alloy, carbon, and low alloy steel, cast iron, and stainless steel components, which were already listed as within the scope of the AMP. The applicant also made a similar revision to LRA Commitment No. 19 to add surfaces of nickel-alloy components, in addition to the other previously listed materials of construction.

The applicant stated that it had reviewed an LRA change made in response to RAI B.2.14-2, dated August 12, 2008, and identified that its earlier change with respect to components in the diesel generator system was incomplete. The applicant further stated that in its earlier change, corrosion monitoring probes in the diesel jacket cooling water system would be used to monitor actual corrosion rates as part of the Closed Cooling Water Chemistry Program and that the Chemical Program Effectiveness Inspection would not be used to monitor corrosion in the diesel jacket cooling water system. The applicant also stated that a subsequent review determined that the corrosion probes are used only to monitor corrosion of steel components, and that the Chemical Program Effectiveness Inspection will be used to confirm that loss of material is not occurring in other diesel jacket cooling water system components, including nickel-alloy (Monel) heat exchanger tube plugs.

The staff reviewed the applicant’s changes to the Chemical Program Effectiveness Inspection “scope of program” program element and commitment as described above. The staff determines that surface examinations provided by the applicant’s Chemical Program Effectiveness Inspection for other materials are also capable of detecting loss of material due to pitting or crevice corrosion in nickel-alloy components. On the basis that the Chemistry Program Effectiveness Inspection AMP includes surface examinations that can detect loss of material in nickel alloy components, the staff finds the applicant’s addition of nickel-alloy components to the “scope of program” program element and to LRA Commitment No. 19 to be acceptable.

Based on its staff’s review, and resolution of the related RAIs as described above, the staff finds the Chemistry Program Effectiveness Inspection consistent with the program elements of GALL AMP XI.M32 and; therefore, is acceptable.

<u>Operating Experience</u>. The staff reviewed the applicant’s OE described in LRA Section B.2.22. The applicant stated that the Chemistry Program Effectiveness Inspection is a new one-time inspection activity for which there is no OE and that inspection methods will be consistent with accepted industry practices. For this program and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued generic RAI B.2.1.

In RAI B.2.1, dated June 10, 2008, the staff requested that the applicant commit to provide documentation of plant-specific operating for staff review, after the program has been implemented, but prior to entering the period of extended operation.

In its response to RAI B.2.1, dated July 8, 2008, the applicant stated that OE for new AMPs described in LRA Appendix B will be gained as these programs are implemented during the period of extended operation. The applicant further stated that results of tests, inspections, and other aging management activities, conducted in accordance with these programs, will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, Quality Assurance Program. The results will be subject to staff review during regional inspections under existing staff inspection modules. The applicant also stated that, to confirm the effectiveness of existing AMPs, one-time inspections will be performed prior to entry into the period of extended operation, and that these programs are subject to review under NRC Inspection Procedure 71003, “Post-Approval Site Inspection for License Renewal.”

The staff notes the applicant’s statement that inspection methods will be consistent with industry practices is consistent with the “operating experience” program element for GALL AMP XI.M32. The staff also notes that post-approval site inspections provide an opportunity for staff review and assessment of the effectiveness of the applicant’s Chemistry Program Effectiveness Inspection, after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on internal and external plant OE, will capture OE to support the conclusion that the effects of aging are adequately managed. On this basis, the staff confirms that the “operating experience” program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable and concludes that a separate commitment is not necessary.

UFSAR Supplement. The applicant provided the UFSAR supplement for the Chemistry Program Effectiveness Inspection in LRA Section A.1.2.12, Commitment No. 19. The staff also notes that the applicant has committed to implement the Chemistry Program Effectiveness Inspection for aging management of applicable components during the 10-years prior to the period of extended operation.

Based on this review, the staff finds that the UFSAR supplement summary in LRA Section A.1.2.12 provides an acceptable description of the applicant’s Chemistry Program Effectiveness Inspection because it is consistent with the UFSAR supplement summary description for the One-Time Inspection program in the SRP-LR.

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 review of the applicant’s Chemistry Program Effectiveness Inspection and resolution of the relevant RAIs as described above, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.11 Cooling Units Inspection

Summary of Technical Information in the Application. In LRA Section B.2.23, the applicant described the Cooling Units Inspection Program as a new program that will be consistent with GALL AMP XI.M32, “One-Time Inspection.” The applicant stated that this program will detect and characterize the condition of aluminum, carbon steel, copper alloy, and stainless steel cooling unit components that are exposed to a ventilation environment or to an uncontrolled raw water environment from cooling unit drain pans, and of certain heat exchanger components exposed to treated water or ventilation environments. The applicant further stated that the inspection provides direct evidence as to whether and to what extent, loss of material or reduction of heat transfer has occurred, or may likely occur and result in a loss of intended function.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. In comparing the elements in the applicant's program to those in GALL AMP XI.M32, the staff noted that the program elements in the applicant's AMP claim of consistency with the GALL Report were consistent with GALL AMP XI.M32, with the exception of four program element aspects identified below that the staff determined required additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

In the "scope of program" program element, the applicant stated that this program detects loss of material due to crevice and pitting corrosion and selective leaching of the copper-alloy cooler channel in the control structure heating, ventilation, and air conditioning (HVAC) system. GALL AMP XI.M33, "Selective Leaching of Materials," states that selective leaching generally does not cause changes in dimensions and is difficult to detect. The examination techniques used by the Cooling Units Inspection Program to detect degradation are visual and/or volumetric. Neither one of these techniques by itself will detect selective leaching.

In RAI B.2.23-1, dated June 23, 2008, the staff requested that the applicant justify how this program will manage selective leaching and explain why these components are not included in the Selective Leaching Inspection Program.

In its response to RAI B.2.23-1, dated July 25, 2008, the applicant amended the LRA to credit the Selective Leaching Inspection Program, in place of the Cooling Units Inspection Program, to manage loss of material due to selective leaching of the copper control structure HVAC cooler channels.

Based on its review, the staff finds the applicant's response to RAI B. 2.23-1 acceptable because the applicant has amended the LRA to manage these components for loss of material due to selective leaching with the Selective Leaching Inspection Program, which contains appropriate techniques to manage this aging effect. Therefore, the staff's concern described in RAI B.2.23-1 is resolved.

In the "detection of aging effects" program element, the applicant stated that a combination of established volumetric or visual examination techniques will be used to identify evidence of loss of material or to confirm a lack thereof. However, GALL AMP XI.M32 recommends specific inspection methods which are dependent on aging effects and mechanisms.

In RAI B.2.23-2, dated June 23, 2008, the staff requested that the applicant clarify the inspection techniques that it will use.

In its response to RAI B.2.23-2, dated July 25, 2008, the applicant stated that visual inspection (VT-1 or equivalent) and/or volumetric inspection (radiographic test (RT) or UT) techniques will be used to determine whether crevice or pitting corrosion is occurring; visual inspection (VT-3 or equivalent) and/or volumetric inspection (RT or UT) techniques will be used to determine whether galvanic or general corrosion is occurring; and visual inspection (VT-3 or equivalent) techniques will be used to determine whether reduction in heat transfer is occurring. The applicant also stated that the specific inspection technique will be determined prior to the inspection activities and will be consistent with the recommendations in GALL AMP XI.M32.

Based on its review, the staff finds the applicant's response to RAI B. 2.23-2 acceptable because the applicant has identified specific inspection techniques it will use for detection of the aging mechanisms that are consistent with the recommendations in GALL AMP XI.M32.

In the “monitoring and trending” program element, the applicant stated that no actions are taken as part of this program, since it is a one-time inspection activity. In the “monitoring and trending” program element, GALL AMP XI.M32 states that “unacceptable inspection findings are evaluated in accordance with the site corrective action process to determine the need for subsequent (including periodic) inspections…”

In RAI B.2.23-3, dated June 23, 2008, the staff requested that the applicant confirm whether the corrective action program will increase the sample size, in the event aging effects are detected.

In its response to RAI B.2.23-3, dated July 25, 2008, the applicant responded that unacceptable inspection findings will be evaluated under the SSES Corrective Action Program. The evaluation performed under this program will identify appropriate corrective actions, including the need to perform additional inspections.

Based on its review, the staff finds the applicant’s response to RAI B.2.23-3 acceptable because the applicant has confirmed that it will evaluate unacceptable inspection findings under the SSES Corrective Action Program and take appropriate corrective action, including the need to perform additional inspections. The staff further finds the response acceptable because the applicant’s actions are consistent with the recommendations of the GALL AMP XI.M32 “monitoring and trending” program element. Therefore, the staff’s concern described in RAI 2.23-3 is resolved.

In the “acceptance criteria” program element, GALL AMP XI.M32 states that any indication or relevant conditions of degradation detected are evaluated. However, in LRA Section B.2.28, the applicant stated under the acceptance criteria that: “no unacceptable loss of material (or wall thinning), could result in a loss of component intended function, during the period of extended operation, as determined by engineering evaluation.”

In RAI B.2.23-4, dated June 23, 2008, the staff requested that the applicant explain why the acceptance criteria for the Cooling Units Inspection Program differ from the recommendations of the GALL Report and clarify what is meant by “no unacceptable loss of material (or wall thinning).”

In its response to RAI B.2.23-4, dated July 25, 2008, the applicant amended LRA Cooling Unit Inspection Program “acceptance criteria” element to state:

> Any indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications/conditions will be evaluated under the SSES Corrective Action Program to determine whether they could result in a loss of component intended function during the period of extended operation.

Based on its review, the staff finds the applicant’s response to RAI B.2.23-4 acceptable because the applicant has adequately explained why the acceptance criteria for the Cooling Units Inspection Program differ from the recommendations of the GALL Report and has sufficiently clarified what is meant by “no unacceptable loss of material (or wall thinning).” The staff also finds the applicant’s response acceptable because the applicant has amended the “acceptance criteria” program element for this AMP to be consistent with the recommendations in GALL AMP XI.M32. Therefore, the staff's concern described in RAI B.2.23-4 is resolved.

Based on its review, the staff finds the applicant's Cooling Units Inspection Program consistent with the program elements of GALL AMP XI.M32 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.23 and interviewed the applicant's technical personnel to confirm that the plant-specific OE did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific OE have been reviewed by the applicant and are evaluated in the GALL Report.

The "operating experience" program element states that the Cooling Units Inspection Program is a new program and there is no plant-specific program OE indicating the need for an aging management progam. However, the staff noted that the applicant has generated several CRs during walkdowns, surveillance and maintenance activities on the cooling units that are included in the scope of this program.

In RAI B.2.23-5, dated June 23, 2008, the staff requested that the applicant identify whether there exists, any age related degradation documentation for these cooling units.

In its response to RAI B.2.23-5, dated July 25, 2008, the applicant stated that CRs associated with the cooling units within the scope of the Cooling Units Inspection Program have been generated during various routine plant activities. The applicant also stated that a review of those CRs did not identify any age-related degradation for the specific subcomponents addressed by the Cooling Units Inspection Program.

Based on its review, the staff finds the applicant's response to RAI B.2.23-5 acceptable because the applicant has reviewed the condition reports for OE and did not identify any age-related degradation for the specific subcomponents addressed by the Cooling Unit Inspection Program. Therefore, the staff's concern described in RAI B.2.23-5 is resolved.

Furthermore, the staff confirms that the applicant has addressed OE identified after the issuance of the GALL Report. The staff finds that the applicant's Cooling Units Inspection Program can be expected to ensure that the effects of aging will be adequately managed during the period of extended operation.

The staff also confirms that the OE program element satisfies the criterion defined in the GALL Report and the guidance found in SRP LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement for the Cooling Units Inspection Program in LRA Section A.1.2.16, Commitment No. 20. The staff reviewed this section and finds that it is acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.3-2 and because the applicant has committed to implement the Cooling Units Inspection Program within the 10-year period prior to 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 the review of the applicant's Cooling Units Inspection Program and the applicant's response to the staff's RAIs, 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d), and; therefore, is acceptable.

3.0.3.1.12 Heat Exchanger Inspection

Summary of Technical Information in the Application. In LRA Section B.2.24, the applicant described the Heat Exchanger Inspection Program as a new program that will be consistent with GALL Report AMP XI.M32, "One-Time Inspection." The applicant stated that this program will detect and characterize cracking due to SCC and reduction in heat transfer due to fouling of heat exchanger tubes exposed to treated water.

The applicant further stated that the inspection provides direct evidence as to whether, and to what extent, cracking due to SCC or reduction in heat transfer due to fouling has occurred or is likely to occur that may result in a loss of intended function.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report and that the conditions at the plant are bounded by the conditions for which the GALL Report is evaluated. The staff conducted onsite interviews with the applicant to confirm these results.

The staff noted the applicant stated that instead of focusing on a representative sample population, the Heat Exchanger Inspection Program will be applied to all heat exchangers within the scope of the program. The inspection and test techniques will be as recommended by GALL AMP XI.M32 for detecting the aging effect of concern.

The staff reviewed the applicant's license renewal basis document and confirmed that the program scope includes all the heat exchangers likely to be affected by the heat exchanger inspection. In its response to RAI B.2.17-2, dated June 30, 2008, and as identified in the SER section 3.0.3.2.9, the applicant stated that this program will detect and characterize reduction in heat transfer due to fouling of heat exchanger tubes exposed to raw water or a lubricating oil environment, which brought additional components into the scope of this program. The applicant added the diesel-engine driven fire pump heat exchangers and oil coolers in the program scope. The staff noted that the additional components the applicant has brought into the scope of program are appropriate, and are heat exchanger components that require aging management as part of this program.

Based on its review, the staff finds the applicant's Heat Exchanger Inspection Program consistent with the program elements of GALL AMP XI.M32 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.24 and interviewed the applicant's technical personnel to confirm that the plant-specific OE did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific OE have been reviewed by the applicant and are evaluated in the GALL Report.

The applicant stated for the "operating experience" program element that the Heat Exchanger Inspection Program is a new program and there is no plant-specific program OE. However, the applicant further stated that during performance of surveillance tests or preventive maintenance, any observed degradation of tubes would have been documented.

In RAI B.2.24-1, dated June 23, 2008, the staff requested that the applicant identify examples of issues that may have been documented to address age-related degradation of the heat exchanger tubes within the scope of this program, and include them in the OE element.

In its response to RAI B.2.24-1, dated July 25, 2008, the applicant stated that a review of documentation generated during various routine plant activities associated with the heat exchangers was performed within the scope of the Heat Exchanger Inspection Program. The review did not identify any age-related degradation of the heat exchanger tubes within the scope of this inspection.

Based on its review, the staff finds the applicant's response to RAI B.2.24-1 acceptable because the applicant has verified and the staff confirms that the applicant's review of plant OE related to the heat exchangers within the scope of the Heat Exchanger Inspection Program did not identify any age related degradation. Therefore, the staff's concern described in RAI B.2.24-1 is resolved.

The staff finds that the applicant's Heat Exchanger Inspection Program can be expected to ensure that effects of aging will be adequately managed during the period of extended operation.

The staff confirms that the OE program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement for the Heat Exchanger Inspection Program in LRA Section A.1.2.22, Commitment No. 21, amended by letter dated June 30, 2008. The staff reviewed this section and finds it acceptable because it is consistent, with the amendment, with the corresponding program description in SRP-LR Table 3.3-2. The staff confirms that the applicant has amended the UFSAR supplement to include the diesel engine driven fire pump heat exchangers and oil coolers in the UFSAR supplement and had committed to implement the Heat Exchanger Inspection Program within the 10-year period, prior to 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 review of the applicant's Heat Exchanger Inspection Program and the applicant's response to the RAIs, 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.13 Lubricating Oil Inspection

Summary of Technical Information in the Application. In LRA Section B.2.25, the applicant described the "Lubricating Oil Inspection Program" as a new program consistent with GALL AMP XI.M32, "One-Time Inspection Program." The applicant stated that this program will verify the effectiveness of Lubricating Oil Analysis Program by sampling systems and components exposed to lubricating oil. The program will test for a loss of material due to crevice, galvanic, general or pitting corrosion. In addition, this program will also test for selective leaching or reduction in heat transfer due to fouling.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report and that the conditions at the plant are bounded by the conditions for which the GALL Report is evaluated. The staff conducted onsite interviews with the applicant to confirm these results.

In comparing the seven program elements in the applicant's program to those in GALL AMP XI.M32, the staff noted the program elements in the applicant's AMP claim of consistency with the GALL Report were consistent with GALL AMP XI.M32, with the exception of one program element; namely, the "scope of program." The staff determined a need for additional clarification which resulted in the issuance of RAIs. The "operating experience" program element is discussed separately below.

The staff noted that the Lubricating Oil Inspection and Lubricating Oil Analysis Programs manage components in the diesel generator, control structure chilled water, residual heat removal (RHR), reactor core isolation cooling (RCIC), and high-pressure coolant injection (HPCI) systems. It was not clear to the staff whether there are additional systems that require management by these two AMPs because of their exposure to lubricating oil.

In RAI B.2.25-1, dated July 10, 2008, the staff requested that the applicant identify whether there are any other systems exposed to lubricating oil that are within the scope of license renewal.

In its response to RAI B.2.25-1, dated August 12, 2008, the applicant stated that during its review of LRA Section B.2.25, it had identified that the reactor building chilled water system was omitted from the systems that are within the scope of the programs that manage aging for lubricating oils. The staff confirmed that the applicant amended LRA Section B.2.25 to include the reactor building chilled water system within the scope of this program.

Based on its review, the staff finds the applicant's response to RAI B.2.25-1 acceptable because the applicant has identified the reactor building chilled water system as a system exposed to lubricating oil and has amended the LRA to reflect the addition of this system within the scope of the Lubricating Oil Inspection Program.

Operating Experience. The staff reviewed the applicant's OE discussion described in the license renewal basis document for the Lubricating Oil Analysis Inspection Program. The applicant stated that this AMP is a new one-time inspection activity for which there is no OE and that inspection methods will be consistent with accepted industry practices. For this program and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued generic RAI B.2.1

In RAI B.2.1, dated June 10, 2008, the staff requested that the applicant commit to provide documentation of plant-specific OE for staff review, after the program has been implemented, but prior to entering the period of extended operation.

In its response to RAI B.2.1, dated July 8, 2008, the applicant stated that OE for new AMPs described in LRA Appendix B will be gained as these new programs are implemented, during the period of extended operation. The applicant further stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs, will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, Quality Assurance Program and that results will be subject to staff review during regional inspections under existing staff inspection modules. The applicant also stated that one-time inspections will be performed prior to entry to the period of extended operation to confirm the effectiveness of existing AMPs, and that these programs are subject to review under NRC Inspection Procedure 71003, "Post-Approval Site Inspection for License Renewal."

The staff noted the applicant's statement that inspection methods will be consistent with industry practices is consistent with the "operating experience" program element for GALL AMP XI.M32. The staff also noted that post-approval site inspections provide an opportunity for staff to review and assess the effectiveness of the applicant's Lubricating Oil Inspection Program, after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on industry and plant-specific OE, will capture OE to support the conclusion that the effects of aging are adequately managed. On this basis, the staff confirms that the applicant's "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable and concludes that a separate commitment is not necessary.

UFSAR Supplement. The applicant provided the UFSAR supplement summary of the Lubricating Oil Inspection Program in LRA Section A.1.2.29, Commitment No. 49. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.2-1. The staff confirms that the applicant has committed to implementing this program prior to the period of extended operation, and that the applicant has amended the LRA to include the reactor building chilled water system within the scope of the Lubricating Oil Inspection Program. The staff also confirms that the applicant has placed this commitment for the Lubricating Oil Inspection Program in UFSAR Supplement Summary Section A.1.2.29.

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 the audit and review of the applicant's Lubricating Oil Inspection Program and the applicant's responses to the RAIs, the staff finds all program elements consistent with the GALL Report. Also, the staff confirms that the applicant has committed (Commitment No. 49) to implement this program prior to the period of extended operation. 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) and; therefore, is acceptable.

3.0.3.1.14 Main Steam Flow Restrictor Inspection

Summary of Technical Information in the Application. In LRA Section B.2.26, the applicant described the Main Steam Flow Restrictor Inspection Program as a new program that will be consistent with GALL AMP XI.M32, “One-Time Inspection.” The applicant stated that this program will detect and characterize reduction of fracture toughness of the CASS subcomponents of the main steam flow restrictors. The applicant also stated that the inspection will detect cracking that is symptomatic of reduction of fracture toughness. The applicant further stated that reduction of fracture toughness does not cause cracking, but the reduced toughness allows existing cracks to propagate at higher rates.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL Report. In comparing the elements in the applicant’s program to those in GALL AMP XI.M32, the staff noted the program elements in the applicant’s AMP claim of consistency with the GALL Report were consistent with GALL AMP XI.M32, with the exception of the three program element aspects identified below, for which the staff determined required additional clarification. The staff confirmed that the applicant’s plant program contains all of the elements of the referenced GALL Report. Further, the staff conducted onsite interviews with the applicant to confirm these results.

In the “detection of aging effects” program element, the applicant stated that it will use a combination of established visual examination techniques to detect reduction of fracture toughness as evidenced by cracking. However, GALL AMP XI.M32 recommends specific inspection methods dependent on aging mechanisms.

In RAI B.2.26-1, dated June 23, 2008, the staff requested that the applicant clarify the inspection techniques it will use to detect evidence of cracking.

In its response to RAI B.2.26-1, dated July 25, 2008, the applicant stated that pursuant to its response to RAI B.2.26-2, which is provided below, the Main Steam Flow Restrictor Inspection Program has been deleted.

In the “acceptance criteria” program element, GALL AMP XI.M32 states that any indication or relevant conditions of degradation detected are evaluated. In LRA Section B.2.26, the applicant stated that the acceptance criterion is: “no cracking that could result in a loss of component intended function(s) during the period of extended operation, as determined by engineering evaluation.”

In RAI B.2.26-2, dated June 23, 2008, the staff requested that the applicant (a) confirm whether the CASS MS flow restrictors were screened for thermal aging; (b) indicate whether the CASS MS flow restrictors are susceptible to thermal aging; (c) indicate whether flaw tolerance evaluations will be performed, if cracking is detected; and (d) explain what type of corrective actions and monitoring will be implemented, if cracking is detected.

In the response to RAI B.2.26-2, dated July 25, 2008, the applicant stated that consistent with GALL AMP XI.M12, "Thermal Embrittlement of Cast Austenitic Stainless Steel (CASS)," PPL has performed a screening of the CASS portions of the main steam flow restrictors to determine their susceptibility for thermal aging. The applicant determined that the CASS portions of the flow restrictors are not susceptible to reduction of fracture toughness due to thermal embrittlement on the following basis:

The applicant stated that the CASS portions of the flow restrictors were cast by a centrifugal casting method. PPL reviewed the QA documentation packages for the flow restrictors and determined that the castings were constructed from cast austenitic stainless steel, in conformance with material specification SA-351 CF8. This material is a low-molybdenum grade of CASS, as opposed to a high-molybdenum grade (i.e., "M" grade) of CASS material, such as SA- 351 CF8M, which requires 2-3% molybdenum content. Therefore, the steam line flow restrictor castings for SSES are considered to be constructed of low molybdenum (0.5% maximum) content material. In accordance with the guidance provided in the GALL Section XI.M12, the centrifugally-cast, low molybdenum CASS portions of the flow restrictors are not susceptible to thermal embrittlement. As such, the AMP B.2.26 “Main Steam Flow Restrictor Inspection” which was intended to manage reduction of fracture toughness due to thermal embrittlement for CASS portions of the main steam flow restrictors is not an aging management program required for license renewal because, as described above, the CASS portions of the main steam flow restrictors are not susceptible to reduction of fracture toughness due thermal embrittlement.

In addition to the screening for susceptibility for thermal aging, the applicant re-evaluated the other conclusions from the AMR of the main steam flow restrictors. The applicant provided the following results and conclusions of the re-evaluation in its response to RAI B.2.26-2:

- The flow restrictors in the Main Steam system are not pressure boundary components. Therefore, neither ASME Section III nor ANSI B31.1, which typically require a fatigue analysis or the use of stress range reduction factors for 7000 cycles, are applicable. As such, fatigue cracking of the main steam flow restrictors is not an applicable aging effect.

- The Inservice Inspection (ISI) Program was credited to confirm the effectiveness of the BWR Water Chemistry Program to manage a loss of material for the main steam flow restrictors. The basis for crediting the ISI program was that similar materials and environments were inspected by ISI. However, the Chemistry Program Effectiveness Inspection (CPEI) confirms the effectiveness of the BWR Water Chemistry Program. While ISI results may be considered in the development and implementation of the CPEI one-time inspection, the ISI Program is not an aging management program for the main steam flow restrictors.

- Stress Corrosion Cracking (SCC) is not an aging effect requiring management for the main steam flow restrictors because there is no tensile stress in the CASS portions of the flow restrictors to promote SCC. Also, the flow restrictors do not have a pressure boundary function that could be affected by cracking, and cracking will not affect the flow restriction function of the flow restrictors. Extreme cracking that could result in the loss of flow restrictor structural integrity could affect its flow restriction function; however, such a failure is not plausible, given the lack of a driving mechanism for crack initiation and/or crack growth.

The applicant revised LRA Section 3.1.2.1.3, Table 3.1.1, Table 3.1.2-3, Appendix A (Table of Contents, Section A.1.2.30, and Table A-1), and Appendix B (Table of Contents, Table B-1, Table B-2, and Section B.2.26) to reflect these results that reduction in fracture toughness due to thermal embrittlement is not an AERM for license renewal.

The staff reviewed the applicant's response and confirmed that based on the screening criteria provided in GALL AMP XI.M12, the CASS portion of the flow restrictors are not susceptible to reduction of fracture toughness because all centrifugal-cast low-molybdenum steels are not susceptible to this aging effect. Furthermore, based on a review of the drawings provided by the applicant during the audit, the staff determined that these flow restrictors are in-line flow restrictors and therefore, are not pressure boundary components.

Based on its review, the staff finds the applicant's response to RAI B.26-2 acceptable because the applicant has verified and the staff confirms that: (a) the CASS flow restrictors are not susceptible to reduction of fracture toughness due to thermal embrittlement; (b) the flow restrictors are not pressure boundary components; and (c) the BWR Water Chemistry Program and ISI Program are credited for similar material and environments to manage the aging effects of loss of material. The staff agrees with the deletion of the Main Steam Line Flow Restrictor Inspection Program from the LRA. Therefore, the staff's concern described in RAI B.2.26-2 is resolved.

In the "detection of aging effects" program element, the applicant stated that the Main Steam Flow Restrictor Inspection Program will be applied to all eight (four per unit) main steam flow restrictors.

In RAI B.2.26-3, the staff requested that the applicant clarify whether this means that all eight flow restrictors will be inspected and; if not, please provide the sample size, and identify whether the program will provide for increasing the sample size in the event that aging effects are detected.

In its response to RAI B.2.26-3, dated July 25, 2008, the applicant stated that pursuant to its response to RAI B.2.26-2 above, the Main Steam Flow Restrictor Inspection Program has been deleted.

Based on its review, the staff finds the applicant's response to RAI B.2.26-3 acceptable because the applicant has verified and the staff confirms that the Main Steam Flow Restrictor Inspection Program has been deleted. Therefore, the staff's concern described in RAI B.2.26-3 is resolved.

UFSAR Supplement. In its letter dated July 25, 2008, the applicant deleted UFSAR Summary Section A.1.2.30, Commitment No. 22, because the Main Steam Flow Restrictor Inspection Program has been deleted. The staff's evaluation of the applicant's deletion of the Main Steam Flow Restrictor Inspection Program is described above.

Conclusion. In the letter dated July 25, 2008, the applicant responded that pursuant to its response to RAI B.2.26-2 above, the Main Steam Flow Restrictor Inspection Program has been deleted. On the basis that the CASS flow restrictors are not susceptible to reduction of fracture toughness due to thermal embrittlement, the flow restrictors are not pressure boundary components, and LRA Section B.2.2, BWR Water Chemistry Program and Section B.2.1, ISI Program are credited for similar material and environments to manage the aging effects of loss of material, the staff finds the applicant response acceptable and agrees with the deletion of the Main Steam Line Flow Restrictor Inspection Program from the LRA. The staff concurs with the deletion and the staff's basis for agreement is described above.

3.0.3.1.15 Monitoring and Collection System Inspection

Summary of Technical Information in the Application. In LRA Section B.2.27, the applicant described the Monitoring and Collection System Inspection Program as a new program that will be consistent with GALL AMP XI.M32, "One-Time Inspection." The applicant stated that this program will detect and characterize the condition of the internal surfaces of subject components that are exposed to equipment and/or area drainage water and other potential contaminants or fluids. The applicant further stated that the inspection provides direct evidence as to whether, and to what extent, a loss of material due to crevice, general or pitting corrosion, or to MIC has occurred or is likely to occur in the liquid waste management system that may result in a loss of intended function.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. In comparing the elements in the applicant's program to those in GALL AMP XI.M32, the staff noted the program elements in the applicant's AMP claim of consistency with the GALL Report were consistent with GALL AMP XI.M32, with the exception of three program element aspects identified below that the staff determined required additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

In the "detection of aging effects" program element, the applicant stated that a combination of established volumetric or visual examination techniques will be used to identify evidence of loss of material or to confirm a lack thereof. However, GALL AMP XI.M32 recommends specific inspection methods dependent on aging mechanisms.

In RAI B.2.27-1, dated June 23, 2008, the staff requested that the applicant clarify which inspection techniques it will use.

In its response to RAI B.2.27-1, dated July 25, 2008, the applicant stated that visual inspection (VT-1 or equivalent) and/or Volumetric inspection (RT or UT) techniques will be used to determine whether crevice or pitting corrosion is occurring; visual inspection (VT-3 or equivalent) and/or Volumetric inspection (RT or UT) techniques will be used to determine whether galvanic or general corrosion is occurring; and visual inspection (VT-3 or equivalent) techniques will be used to determine whether reduction in heat transfer is occurring. The specific inspection technique will be determined prior to inspection activities and will be consistent with the recommendations in GALL AMP XI.M32.

Based on its review, the staff finds the applicant's response to RAI B.2.27-1 acceptable because the applicant has provided specific inspection techniques for detection of the aging effects and the mechanisms are consistent with the recommendations in GALL AMP XI.M32. Therefore, the staff's concern described in RAI B.2.27-1 is resolved.

In the "monitoring and trending" program element, the applicant stated that no actions are taken as part of this program, since it is a one-time inspection activity. In the "monitoring and trending" program element, the GALL AMP XI.M32 states that "unacceptable inspection findings are evaluated in accordance with the site corrective action process to determine the need for subsequent (including periodic) inspections…"

In RAI B.2.27-2, dated June 23, 2008, the staff requested that the applicant confirm whether the corrective action program will increase the sample size, in the event aging effects are detected.

In its response to RAI B.27-2, dated July 25, 2008, the applicant stated that unacceptable inspection findings will be evaluated under the SSES Corrective Action Program, which will identify appropriate corrective actions, including the need to perform additional inspections.

Based on its review, the staff finds the applicant's response to RAI B.2.27-2 acceptable because the applicant will evaluate unacceptable inspection findings under its corrective action program and take appropriate corrective action, including performance of additional inspections, which is consistent with the recommendations of the GALL AMP XI.M32 "monitoring and trending" program element. Therefore, the staff's concern described in RAI B.2.27-2 is resolved.

In the "acceptance criteria" program element, GALL AMP XI.M32 states that any indication or relevant conditions of degradation detected are evaluated. In LRA Section B.2.27, the applicant stated the following acceptance criteria: "no unacceptable loss of material (or wall thinning) that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation."

In RAI B.2.27-3, dated June 23, 2008, the staff requested that the applicant explain why the acceptance criteria for the Monitoring and Collection System Inspection Program differ from the recommendations of the GALL Report, and clarify what is meant by "no unacceptable loss of material (or wall thinning)."

In its response to RAI B.2.27-3, dated July 25, 2008, the applicant amended the Monitoring and Collection System Inspection Program acceptance criteria" program element to state:

> Any indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications/conditions will be evaluated under the SSES Corrective Action Program to determine whether they could result in a loss of component intended function during the period of extended operation.

Based on its review, the staff finds the applicant's response to RAI B.2.27-3 acceptable because the applicant has appropriately amended the Monitoring and Collection System Inspection Program "acceptance criteria" program element to be consistent with the recommendations provided in GALL AMP XI.M32. Therefore, the staff's concern described in RAI B.2.27-3 is resolved.

Based on its review, the staff finds the Monitoring and Collection System Inspection Program consistent with the program elements of GALL AMP XI.M32 and; therefore, is acceptable.

<u>Operating Experience</u>. The staff reviewed the applicant's OE described in LRA Section B.2.27 and interviewed the applicant's technical personnel to confirm that the plant-specific OE did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific OE have been reviewed by the applicant and are evaluated in the GALL Report.

The "operating experience" program element in the LRA states that the Monitoring and Collection System Inspection Program is a new program and there is no plant-specific program OE. Furthermore, the staff confirmed that the applicant has addressed OE identified after the issuance of the GALL Report. However, for this program and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued a generic RAI.

In RAI B.2-1, dated June 10, 2008, the staff requested that the applicant commit to provide documentation of plant-specific OE for staff review, after the program has been implemented, but, prior to entering the period of extended operation.

In its response to RAI B.2.1, dated July 8, 2008, the applicant stated that OE for new AMPs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant further stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, Quality Assurance Program and that results will be subject to staff review during regional inspections under existing staff inspection modules. The applicant also stated that one-time inspections will be performed prior to entry to the period of extended operation, to confirm the effectiveness of existing AMPs, and that these programs are subject to review under NRC Inspection Procedure 71003, “Post-Approval Site Inspection for License Renewal.”

The staff noted the applicant’s statement that inspection methods will be consistent with industry practices is consistent with the “operating experience” program element for GALL AMP XI.M32. The staff also noted that post-approval site inspections provide an opportunity for staff to review and assess the effectiveness of the applicant’s Monitoring and Collection System Inspection Program, after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on internal and external plant OE, will capture OE to support the conclusion that the effects of aging are adequately managed. On this basis, the staff finds this program element acceptable and concludes that a separate commitment is not necessary.

The staff confirms that the “operating experience” program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Monitoring and Collection System Inspection Program in LRA Section A.1.2.33, Commitment No. 23. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.3-2. The staff also finds that the applicant has committed to implement the Monitoring and Collection System Inspection Program within the 10-year period, prior to 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 the review of the applicant’s Monitoring and Collection System Inspection Program and the applicant’s response to the staff’s RAIs, 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d), and; therefore, is acceptable.

3.0.3.1.16 Supplemental Piping/Tank Inspection Program

Summary of Technical Information in the Application. In LRA Section B.2.28, the applicant described the Supplemental Piping/Tank Inspection Program as a new program that will be consistent with GALL Report AMP XI.M32, “One-Time Inspection.” The applicant stated that this program will detect and characterize the condition of carbon and stainless steel components that are exposed to moist air environments, particularly the aggressive wet and/or dry environment that exists at air-water interfaces. The applicant further stated that the inspection provides direct evidence as to whether and to what extent, loss of material due to crevice, galvanic, general and pitting corrosion, has occurred or is likely to occur that could result in a loss of intended function.

Staff Evaluation. During its audit, the staff confirmed the applicant’s claim of consistency with the GALL Report. In comparing the elements in the applicant’s program to those in GALL AMP XI.M32, the staff noted that the program elements in the applicant’s AMP claimed to be consistent with GALL were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M32 with the exception of below identified four program element aspects that the staff determined were in need of additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report program. On-site interviews were also held to confirm these results.

In the “scope of program” program element, the LRA identifies systems and components within the scope of the program. In Table 3.2.2-9, diesel generator starting air system, the Supplemental Piping/Tank Inspection Program is credited for managing the aging effect of loss of material for stainless steel drain trap bodies and carbon steel moisture separators. However, this system and components are not included in the scope of this program. The staff issued RAI B.2.28-1 by letter dated June 23, 2008, to request the applicant to justify why this system is not included in the program scope.

In its letter dated July 25, 2008, the applicant responded to RAI B.2.28-1 stating that the carbon steel moisture separators and stainless steel drain trap bodies in the diesel generator starting air system are within the scope of the Supplemental Piping/Tank Inspection. The applicant further stated the Diesel Generators system should have been included in the listing of systems within the scope of this inspection, but was inadvertently omitted. The applicant revised the LRA Section B.2.28 “scope of program” element to include diesel generators system in the list of systems within the scope of this program.

On the basis that the diesel generators system is added to the scope of the program and thus accurately identifying components and systems in the scope of this program, the staff finds the response acceptable. Therefore, the staff’s concern described in RAI B.2.28-1 is resolved.

In the letter dated October 21, 2008, in response to the NRC regional inspection of the LRA, the applicant revised the “scope of program” program element to include diesel fuel oil system in the list of systems within the scope of the program.

On the basis that the diesel fuel oil system is added to the scope of the program and thus accurately identifying components and systems in the scope of this program, the staff finds the revision acceptable.

In the letter dated September 30, 2008, in response to the NRC regional inspection of the LRA, the applicant revised the “scope of program” program element to include aging management of loss of material due to crevice, galvanic, general, and pitting corrosion within the air space of diesel generator starting air receiver tanks and E diesel compressor skid air receiver tanks. The applicant also revised the “detection of aging effects” program element to include at least 2 of these tanks in the sample population for inspection.

On the basis that the diesel generator starting air receiver tanks and E diesel compressor skid air receiver tanks are included in the sample population, the staff finds the response acceptable because the applicant has included these tanks in the program scope and two of these tanks will be part of the sample population that will be inspected, which will provide inspection results that could be evaluated and applied to the other tanks.

In the “detection of aging effects” program element, the LRA states that a combination of established volumetric or visual examination techniques will be used to identify evidence of loss of material or to confirm a lack thereof. However, the GALL AMP XI.M32, “One-Time Inspection,” recommends specific inspection methods dependent on aging effects and mechanisms. The staff issued RAI B.2.28-2 by letter dated June 23, 2008, to request the applicant to clarify the inspection techniques that will be used for the different aging effects and mechanisms.

In the letter dated July 25, 2008, the applicant responded to RAI B.2.28-2 stating that visual inspection (VT-1 or equivalent) and/or Volumetric inspection (RT or UT) techniques will be used to determine whether crevice or pitting corrosion is occurring; visual inspection (VT-3 or equivalent) and/or Volumetric inspection (RT or UT) techniques will be used to determine whether galvanic or general corrosion is occurring; and visual inspection (VT-3 or equivalent) techniques will be used to determine whether reduction in heat transfer is occurring. The applicant stated the specific inspection technique will be determined prior to the inspection activities and will be consistent with the recommendations in GALL AMP XI.M32.

The staff reviewed the applicant’s response and finds the specific inspection techniques provided by the applicant for detection of the aging effects and mechanisms are consistent with the recommendations provided by GALL AMP XI.M32 and are acceptable. On this basis, the staff finds the applicant response acceptable.

In the “monitoring and trending” program element, the LRA states that no actions are taken as part of this program, since it is a one-time inspection activity. In the “monitoring and trending” program element, GALL AMP XI.M32 states that unacceptable inspection findings are evaluated in accordance with the site corrective action process to determine the need for subsequent (including periodic) inspections. The staff issued RAI B.2.28-3 by letter dated June 23, 2008, to request the applicant to confirm if the corrective action program will increase the sample size in the event aging effects are detected.

In the letter dated July 25, 2008, the applicant responded to RAI B.2.28-3 stating that unacceptable inspection findings will be evaluated under the SSES corrective action program. The evaluation done under the SSES corrective action program will identify appropriate corrective actions, including the need to perform additional inspections.

On the basis that the applicant will evaluate unacceptable inspection findings under the SSES corrective action program and take appropriate corrective action including the need to perform additional inspections, the staff finds the response acceptable because the applicant is consistent with the recommendations of the GALL AMP XI.M32 “monitoring and trending” program element.

In the “acceptance criteria” program element, the GALL AMP XI.M32 states that any indication or relevant conditions of degradation detected are evaluated. The LRA Section B.2.28 identifies acceptance criteria as: no unacceptable loss of material (or wall thinning) that could result in a loss of component intended function during the period of extended operation, as determined by engineering evaluation. The staff issued RAI B.2.28-4 by letter dated June 23, 2008, to request the applicant to explain why the acceptance criteria for AMP B.2.28 differ from the recommendations of the GALL Report and to clarify what “no unacceptable loss of material (or wall thinning)” means.

In the letter dated July 25, 2008, the applicant amended LRA Section B.2.28, Supplemental Piping/Tank Inspection Program “acceptance criteria” program element to state:

> Any indications or relevant conditions of degradation detected during the inspections will be compared to pre-determined acceptance criteria. If the acceptance criteria are not met, then the indications/conditions will be evaluated under the SSES Corrective Action Program to determine whether they could result in a loss of component intended function during the period of extended operation.

The staff reviewed the applicant’s response and finds that the amended “acceptance criteria” program element is consistent with the recommendations provided in GALL AMP XI.M32, and therefore the staff finds the response acceptable.

In a letter dated January 12, 2009, the applicant amended the scope of the Supplemental Piping and Tanks Inspection Program to include the internal steel and stainless steel emergency diesel generator exhaust piping, piping component, and piping element surfaces that are exposed to the diesel exhaust environment (which is identified in LRA Table 3.0-1 as a subsection of the ventilation air environment). The staff noted that the applicant made the applicable amendment of this AMP in order to conform to the staff’s recommendations in SRP-LR Section 3.3.2.2.3.3 and the GALL AMR VII.H2-1, for the management of stress corrosion cracking in stainless steel diesel generator exhaust piping components and in SRP-LR Section 3.3.2.2.7.3 and GALL AMR VII.H2-2, for the management of loss of material in steel stainless steel emergency diesel generator exhaust piping components. The staff finds that the applicant amendment of the LRA to include the internal surfaces of these components is acceptable because it conforms to the staff’s aging management recommendations in these SRP-LR and GALL AMR sections that a valid AMP be credited to manage cracking and loss of material in these diesel generator exhaust piping components. The staff’s evaluations in SER Sections 3.3.2.2.3.3 and 3.3.2.2.7.3 provide additional details on why it is acceptable to credit this AMP for aging management of these emergency diesel generator exhaust piping components.

Based on its review, the staff finds the Supplementary Piping/Tank Inspection Program consistent with the program elements with the program elements of GALL AMP XI.32, and therefore acceptable.

Operating Experience. The staff reviewed the operating experience described in LRA Section B.2.28 and interviewed the applicant’s technical personnel to confirm that the plant-specific operating experience did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific operating experience have been reviewed by the applicant and are evaluated in the GALL Report.

The “operating experience” program element in the LRA states that the Supplementary Piping/Tank Inspection is a new program and there is no plant-specific program operating experience. Furthermore, the staff confirmed that the applicant has addressed operating experience identified after the issuance of the GALL Report. However, for this program and for other new AMPs where the applicant provided no current plant-specific operating experience, the staff issued generic RAI B.2-1 by letter dated June 10, 2008, asking that the applicant commit to provide documentation of plant-specific operating experience for staff review after the program has been implemented, but prior to entering the period of extended operation.

In the letter dated July 8, 2008, the applicant responded to RAI B.2-1 and stated that operating experience for new aging management programs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the SSES 10 CFR 50, Appendix B, quality assurance program and that results will be subject to NRC review during regional inspections under existing NRC inspection modules. The applicant further stated that one-time inspections will be performed prior to entry to the period of extended operation to confirm the effectiveness of existing aging management programs and that these programs are subject to review under NRC Inspection Procedure 71003, Post-Approval Site Inspection for License Renewal.

The staff noted that the applicant’s statement that inspection methods will be consistent with industry practices is consistent with the “operating experience” program element for GALL AMP XI.M32. The staff also noted that post-approval site inspections provide an opportunity for staff review and assessment of the effectiveness of the applicant’s Supplementary Piping/Tank Inspection Program after the applicant has developed operating experience with that program. The staff concludes that the corrective action program, based on internal and external plant operating experience, would capture operating experience in the future to support the conclusion that the effects of aging are adequately managed. On this basis, the staff finds this program element acceptable and concludes that a separate commitment is not necessary.

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.1.2.46, Commitment No. 24, the applicant provided the UFSAR supplement for the Supplementary Piping/Tank Inspection Program. The staff verified that the UFSAR supplement summary description for the Supplementary Piping/Tank Inspection Program was in conformance with the staff’s recommended UFSAR supplement for the One-Time Inspection Program provided in Table 3.3-2 of the SRP-LR.

Based on this review, the staff finds that UFSAR supplement Section A.1.2.46 provides an acceptable UFSAR Supplement summary description of the applicant’s Supplementary Piping/Tank Inspection Program because it is consistent with the UFSAR supplement summary description in the SRP-LR for the One-Time Inspection Program and because the applicant has included in Table A-1, Commitment No. 24 to implement the Supplementary Piping/Tank Inspection Program within the 10-year period prior to the period of extended operation.

The staff reviewed this section and determines that the information in the UFSAR supplement provides an adequate summary description of the program consistent with the SRP-LR, as required by 10 CFR 54.21(d).

Conclusion: On the basis of its review of the applicant's Supplementary Piping/Tank Inspection Program and the applicant's response to the staff's RAIs, 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.17 Selective Leaching Inspection Program

Summary of Technical Information in the Application. In LRA Section B.2.29, the applicant described the new Selective Leaching Program as consistent with GALL AMP XI.M33, "Selective Leaching of Materials." This program combines the use of a visual inspection with a hardness test on the external and internal surfaces of materials susceptible to selective leaching, to determine whether the aging effect of loss of material due to selective leaching has occurred.

Staff Evaluation. During its audit, the staff confirmed the applicant's claim of consistency with the GALL Report. In comparing the elements in the applicant's program to those in GALL AMP XI.M33, the staff noted the program elements in the applicant's AMP claim of consistency with the GALL Report were consistent with GALL AMP XI.M33, with the exception of the one program element aspect identified below that the staff determined required additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

The staff reviewed the applicant's Program Evaluation Document and confirmed that the program scope includes all systems that could be susceptible to selective leaching. The staff noted that this includes copper alloys (brass and bronze), cast iron, and ductile iron exposed to raw water, treated water, groundwater (buried), indoor air with condensation, outdoor air, and fuel oil environments. The staff further noted that twenty-five plant systems have this combination of material and environment and include susceptible components that include piping and tubing, valve bodies, pump and turbocharger casings, heat exchangers, coolers, chillers, hydrants, sprinkler heads, strainers, level gauges, orifices, and heater sheaths. The staff finds the applicant's Selective Leaching Program acceptable because it conforms to the recommendations in GALL AMP XI.M33.

During the review of the applicant's Cooling Unit Inspection Program (SER section 3.0.3.1.11), the staff noted that the "scope of program" element in the LRA states that loss of material due to crevice corrosion, pitting corrosion, and selective leaching of the copper-alloy cooler channel in the control structure HVAC system. As stated in the GALL Report, selective leaching does not cause a noticeable change in dimensions and is difficult to detect using visual and/or volumetric detection techniques, which are the techniques used in the Cooling Unit Inspection Program.

In RAI B.2.23-1, dated June 23, 2008, the staff requested that the applicant justify the use of the Cooling Unit Inspection Program to manage loss of material due to selective leaching in the control structure HVAC system. The staff also requested that the applicant explain why the copper-alloy cooler channel was not included within the scope of the Selective Leaching Inspection Program.

In the response to RAI B.2.23-1, dated July 25, 2008, the applicant stated that the LRA has been amended to credit the Selective Leaching Inspection Program, in place of the Cooling Unit Inspection Program, to manage loss of material due to selective leaching for the copper alloy cooler channel in the control structure HVAC system.

Based on the review, the staff finds the applicant's response to RAI B.2.23-1 acceptable because the applicant has amended the LRA to credit the Selective Leaching Program to manage loss of material due to selective leaching for the copper-alloy cooler channel in the control structure HVAC system. Therefore, the staff's concern described in RAI B.2.23-1 is resolved.

Based on the review, the staff finds the Selective Leaching Program consistent with the program elements in GALL AMP XI.M33 and; therefore, is acceptable.

Operating Experience. The applicant stated that the Selective Leaching Program is a new program for which there is no OE and that inspection methods will be consistent with accepted industry practices. For this program and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued a generic RAI.

In RAI B.2.1, dated June 10, 2008, the staff requested that the applicant commit to provide documentation of plant-specific operating for staff review, after the program has been implemented, but, prior to entering the period of extended operation.

In the response to RAI B.2.1, dated July 8, 2008, the applicant stated that OE for new AMPs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, Quality Assurance Program. Results will be subject to staff review during regional inspections under existing staff inspection modules. The applicant stated that these new programs will be implemented prior to, and continue through, the period of extended operation and that OE will be gained for these programs as they are implemented. The applicant further stated that test and inspection results that do not meet acceptance criteria for these new programs will be evaluated under the applicant's corrective action program, which includes requirements for identification of appropriate corrective actions and verification of the effectiveness of corrective actions.

The staff noted the applicant's statement that inspection methods will be consistent with industry practices is consistent with the "operating experience" program element for GALL AMP XI.M33. The staff also noted that post-approval site inspections provide an opportunity for the staff to review and assess the effectiveness of the applicant's Selective Leaching Program, after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on internal and external plant OE, will capture OE to support the conclusion that the effects of aging are adequately managed.

On this basis, the staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable and concludes that a separate commitment is not necessary.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Selective

Leaching Program in LRA Section A.1.2.43, Commitment No. 25. The staff reviewed this section and determines that the information in the UFSAR supplement provides an adequate summary description of the program consistent with the SRP-LR, as required by 10 CFR 54.21(d). The staff confirms that the applicant has made a commitment to implement this new program, after issuance of the renewed license and prior to entering the period of extended operation.

Conclusion. On the basis of the review of the applicant's Selective Leaching Program and the applicant's RAI responses, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging the will be adequately managed so that the intended functions of these components 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) and; therefore, is acceptable.

3.0.3.1.18 Small Bore Class 1 Piping Inspection Program

Summary of Technical Information in the Application. In LRA Section B.2.31, the applicant described the new Small Bore Class 1 Piping Inspection as consistent with GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping." The applicant stated that the program is a one-time inspection program to confirm the effectiveness of the BWR Water Chemistry Program in mitigating loss of material and cracking for small bore Class 1 piping and also to verify, by inspections for cracking, that reduction of fracture toughness due to thermal embrittlement requires no additional aging management for small bore Class 1 piping. The applicant also stated that the program is applicable to small bore ASME Code Class 1 piping and piping components less than four inches nominal pipe size (<NPS 4), which includes pipes, fittings, and branch connections, and that the inspection provides additional assurances that either aging of small bore ASME Code Class 1 piping is not occurring or that the aging is insignificant. The applicant further stated that implementation of the program is scheduled to be completed during the 10-year period, prior to the period of extended operation (Commitment No. 27, LRA Table A-1).

Staff Evaluation. During the audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's AMP evaluation for the Small Bore Class 1 Piping Inspection Program, together with the applicant's program outline which provides specific guidance for preparation of implementing procedures related to this new program. In comparing the program description and elements in the applicant's AMP to those in GALL AMP XI.M35, the staff noted a number of instances where the program description and elements that the applicant claimed to be consistent with the GALL Report did not appear to be consistent with the corresponding program element criteria recommended in GALL AMP XI.M35. Furthermore, it appeared to the staff that for the one-time inspection of small-bore Code Class 1 piping, the applicant combined recommendations in GALL AMP XI.M35 with recommendations in GALL AMP XI.M32, "One-Time Inspection." The applicant's AMP resulting from this combination was substantially different from GALL AMP XI.M35, with which the applicant claimed consistency. The staff identified a need for additional clarification and issued four RAIs to support the staff's evaluation of the applicant's Small Bore Class 1 Piping Inspection program. The staff evaluates the applicant's responses to these RAIs in the following discussions.

The applicant stated in the LRA that the Small Bore Class 1 Piping Inspection Program, is a new program that will be consistent with GALL AMP XI.M35. The applicant further stated that the GALL AMP XI.M35 is credited only with managing the aging effect of cracking, and the only examination technique used is volumetric examination. However, in the LRA, both in the program description and in several aging management review line items, the Small Bore Class 1 Piping Inspection is credited with confirming effectiveness of the BWR Water Chemistry Program in mitigating the aging effect of loss of material using “nondestructive examinations (including volumetric techniques).”

In RAI B.2.31-1, dated June 23, 2008, the staff requested that the applicant provide the basis for categorizing the Small Bore Class 1 Piping Inspection Program as being consistent with the GALL AMP XI.M35 when the Small Bore Class 1 Piping Inspection Program implies that non-volumetric examination techniques may be used as an alternate basis for performing the one-time inspections of the small bore Class 1 piping components and when this AMP is credited with managing an aging effect (i.e., loss of material) that is not within the scope of the GALL AMP XI.M35. The staff also requested that the applicant clarify whether the LRA will be amended to identify these aspects of the program as exceptions to GALL AMP XI.M35 and; if so, justify the basis for crediting these exceptions for aging management of small bore Class 1 piping components.

In its response to RAI B.2.31-1, dated July 25, 2008, the applicant stated the following:

> The SSES LRA is amended [as shown in a multi-page attachment] to demonstrate that AMP B.2.31, Small Bore Class 1 Piping Inspection, is consistent with GALL AMP XI.M35 with no exceptions.
>
> AMP B.2.31 is credited for managing the aging effect of cracking, as a result of stress corrosion or thermal or mechanical loading, and one-time volumetric examination is the acceptable method for confirming that cracking of ASME Code Class 1 small-bore piping is not occurring.
>
> AMP B.2.22, Chemistry Program Effectiveness Inspection, is credited with verifying the effectiveness of AMP B.2.2, BWR Water Chemistry Program, to mitigate loss of material.

The applicant provided a multi-page attachment (Attachment 3 to PLA-6391, LRA Revisions in Response to RAIs B.2.31-1 and B.2.31-3) as part of the response, in which the applicant described revisions to LRA text and tables affected by its responses to RAIs B.2.31-1 and B.2.31-3.

The staff noted the changes affecting text related to AMP descriptions and the AMR results tables as well as evaluations in the LRA.

The AMP related text sections in the LRA affected by the applicant’s changes are as follows:

> Section A.1.2.44, the UFSAR supplement describing the Small Bore Class 1 Piping Inspection was revised to delete aging management for loss of material and to state: “Small Bore Class 1 Piping Inspection is a one-time inspection to detect cracking resulting from thermal and mechanical loading or intergranular stress corrosion. The inspection will provide assurance that either cracking of small bore Class 1 piping is not occurring or the cracking is insignificant, such that an aging management program (AMP) is not warranted. The inspection will also confirm the effectiveness of the BWR Water Chemistry Program in

mitigating cracking due to intergranular stress corrosion."

Table A-1, "SSES License Renewal Commitments," was revised to state in Commitment No. 27 that the Small Bore Class 1 Piping Inspection will verify that cracking is not occurring and thereby validate the effectiveness of the Chemistry Program to mitigate cracking.

Section B.2.22, "Chemistry Program Effectiveness Inspection," was revised to include reactor coolant system (RCS) pressure boundary components within the scope of the program.

Section B.2.31, Small Bore Class 1 Piping Inspection, was revised in multiple places consistent with removing management of loss of material from the scope of the program and relocating it into the Chemistry Program Effectiveness Inspection program. The changes clarified that the focus of the Small Bore Class 1 Piping Inspection Program is to detect cracking resulting from thermal and mechanical loading or intergranular stress corrosion and that the non-destructive examination will use volumetric techniques, consistent with the recommendations in GALL AMP XI.M35. The applicant stated that the program may also include destructive examinations.

LRA Appendix C, "Response to BWRVIP Applicant Action Items, Discussion of BWRVIP-74-A," was revised to state that effectiveness of the BWR Water Chemistry Program to mitigate cracking in the flange leak detection lines will be verified by the Chemistry Program Effectiveness Inspection (rather than the previously identified Small Bore Class 1 Piping Inspection Program).

The AMR results tables and evaluations in the LRA affected by the applicant's changes are as follows:

- Table 3.1.1, "Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System"

- Table 3.1.2-3, "Aging Management Review Results – Reactor Coolant System Pressure Boundary"

- Section 3.1.2.2.3.1, "BWR Top Head and Top Head Nozzles, PWR Steam Generator Shell Assembly"

- Section 3.1.2.2.2.3, "Flanges, Nozzles, Penetrations, Pressure Housings, Safe Ends, and Vessel Shells, Heads, and Welds"

- Section 3.1.2.2.4.1, "BWR Top Head Enclosure Vessel Flange Leak Detection Lines"

- Section 3.1.2.2.8.1, "Stainless Steel Jet Pump Sensing Lines"

The staff reviewed all of the applicant's LRA changes, noting that the changes removed the activities associated with monitoring for loss of material from the scope of the Small Bore Class 1 Piping Inspection Program and reassigned them to the Chemistry Program Effectiveness Inspection, consistent with the GALL AMP XI.M32. By making these changes, the applicant fully addressed and resolved the staff's concerns with the applicant's Small Bore Class 1 Piping Inspection program, as initially described in the LRA, combined elements of the GALL AMP XI.M32 with elements of GALL AMP XI.M35. However, in its review of the applicant's LRA changes, the staff noted the following three instances in which the as-revised LRA did not appear to conform with the applicant's general approach of removing activities associated with monitoring for loss of material from the scope of the Small Bore Class 1 Piping Inspection Program and reassigning them to the Chemistry Program Effectiveness Inspection:

- The change in LRA Section 3.1.2.2.4.1, "BWR Top Head Enclosure Vessel Flange Leak Detection Lines," that replaced use of the Small Bore Class 1 Piping Inspection Program with the Chemistry Program Effectiveness Inspection for monitoring the aging effect of cracking due to SCC in stainless steel lines exposed to treated water, did not appear to be appropriate.
- The change in LRA Section 3.1.2.2.8.1, "Stainless Steel Jet Pump Sensing Lines," that replaced use of the Small Bore Class 1 Piping Inspection Program with the Chemistry Program Effectiveness Inspection for monitoring the aging effect of cracking in the stainless steel lines external to the vessel, did not appear to be appropriate.
- The change in LRA Appendix C, "Response to BWRVIP Applicant Action Items," which was made for consistency with the change in LRA Section 3.1.2.2.4.1, also did not appear to be appropriate.

In RAI B.2.31-5, the staff requested that the applicant explain the basis for these changes.

In addition, the staff noted that in making the changes to the LRA, the applicant introduced wording that referred to "significant" and "insignificant" cracking.

In RAI B.2.31-6, the staff requested that the applicant clarify the meaning of "significant" and "insignificant" cracking or eliminate the problematic wording.

In its response to RAI B.2.31-5, dated September 11, 2008, the applicant reversed the changes that had been made in LRA Sections 3.1.2.2.4.1 and 3.1.2.2.8.1 and Appendix C, and restored these affected parts of the LRA to the version originally submitted by the applicant.

Based on the review, the staff finds the applicant's response to RAI B.2.31-5 acceptable because the applicant has reversed the changes to the LRA that were made in error and restored the LRA text affected by these changes to the originally submitted version of these LRA Sections, so that monitoring for loss of material will be performed by the Chemistry Program Effectiveness Inspection and monitoring for cracking will be performed by the Small Bore Class 1 Piping Inspection Program. Therefore, the staff's concern described in RAI B.2.31-5 is resolved.

In the response to RAI B.2.31-6, dated September 11, 2008, the applicant revised text in LRA Section A.1.2.44 to state that the Small Bore Class 1 Piping Inspection will provide assurance that cracking of small bore Class 1 piping is not occurring or an evaluation of any detected crack indications will be performed to justify continued operation with no further monitoring, such that an AMP is not warranted. The applicant also revised the "program description" in LRA Section B.2.31 to include a similar statement and also to state that should cracking be revealed by a one-time inspection or previous OE, periodic inspection will be performed under a plant-specific AMP, unless cracking is evaluated and determined to be acceptable for continued operation during the period of extended operation, with no further monitoring. The applicant also revised the “monitoring and trending” program element in LRA Section B.2.31 to include a similar statement.

Based on the review, the staff finds the applicant’s response to RAI B.2.31-6 acceptable because the applicant has removed problematic wording from the LRA and has provided acceptable criteria for the disposition of crack indications, if found by the Small Bore Class 1 Piping Inspection Program. Therefore, the staff’s concern described in RAI B.2.31-6 is resolved.

The staff reviewed the composite of LRA changes made by the applicant in response to RAI B.2.31-1, as amended by the applicant’s responses to RAIs B.2.31-5 and B.2.31-6, and determines that the as-revised program description and program elements for the applicant’s Small Bore Class 1 Piping Inspection Program are consistent with GALL AMP XI.M35.

Based on the review, the staff finds the applicant’s response to RAI B.2.31-1 acceptable because the applicant has appropriately revised the LRA sections and table to ensure consistency with GALL AMP XI.M35. Therefore, the staff’s concerns described in RAI B.2.31-1 are resolved

The applicant stated in the LRA that the Small bore Class 1 Piping Inspection Program will be used to monitor both the aging effect of cracking and the aging effect of loss of material in Class 1 small bore piping. However, the environmental stressors that may lead to cracking are not necessarily the same as the environmental stressors that may lead to loss of material.

In RAI B.2.31-2, dated June 23, 2008, the staff requested that the applicant clarify the selection processes and criteria that will be applied to ensure that the program will select and schedule inspections for the most limiting small bore Class 1 piping locations for both of these aging effects.

In the response to RAI B.2.31-2, dated July 25, 2008, the applicant stated:

> The Small Bore Class 1 Piping Inspection, as amended in the response to RAI B.2.31-1, is credited to manage only cracking. As such, in the selection of the small bore Class 1 piping locations for the one-time inspection, there is no need to consider environmental stressors that may lead to loss of material.
>
> The selection criteria to be applied as part of this program are provided in the “Monitoring and Trending” program element discussion in LRA Section B.2.31.

The staff notes that the applicant’s revision to the LRA eliminated management of loss of material from the scope of the Small Bore Class 1 Piping Inspection Program. Because the revised AMP manages only the aging effect of cracking, which is consistent with the recommendations in GALL AMP XI.M35, the potential issue addressed in RAI B.2.31-2 was eliminated by the LRA amendment that resulted from RAI B.2.31-1.

Based on the review, the staff finds the applicant’s response to RAI B.2.31-2 acceptable because the applicant has revised the Small Bore Class 1 Piping Inspection Program to manage only the aging effect of cracking, consistent with the recommendations in the GALL AMP XI.M35. Therefore, the staff’s concern described in RAI B.2.31-2 is resolved.

In describing the Small Bore Class 1 Piping Inspection Program, under the program element “monitoring and trending” in LRA Section B.2.31, the applicant stated that actual inspection locations will be based on physical accessibility, exposure levels, nondestructive examination techniques, and locations identified in NRC Information Notice (IN) 97-46. IN 97-46 was written relative to cracking that was detected in small bore unisolable high-pressure injection piping at Oconee Unit 2, which is a pressurized water reactor (PWR).

In RAI B.2.31-3, dated June 23, 2008, the staff requested that the applicant justify the basis for applying the Oconee Unit 2 experience as applicable OE for the Small Bore Class 1 Piping Inspection Program, and clarify how the information contained in IN 97-46 will be applied in the selection process in order to ensure that the small bore Class 1 piping locations most susceptible to cracking, as a result of thermal and mechanical loading or SCC, will be selected for the one-time inspection.

In the response to RAI B.2.31-3, dated July 25, 2008, that applicant stated:

> The considerations in determining the inspection for AMP B.2.31, Small Bore Class 1 Piping Inspection, include operating experience and related industry guidance documents. Operating experience to date includes NRC Information Notice (IN) 97-46, which was issued to all holders of operating licenses or construction permits for power reactors (BWRs and PWRs). IN 97-46 states that a gap between a thermal sleeve and the associated safe-end allowed intermittent mixing of the hot reactor coolant and the cooler makeup water flowing through the pipeline, resulting in alternating heating and cooling of the weld between the pipe and the safe-end. This phenomenon was a likely contributor to the fatigue cracking that occurred at the weld. PPL will consider the potential for piping locations to experience intermittent mixing between hot and cold flows in the sample selection of inspection locations for AMP B.2.31.
>
> The SSES LRA is amended to state, more generally, that operating experience will be considered, without referencing a specific document such as IN-97-46.

In evaluating the applicant's response, the staff reviewed the changes made by the applicant in the LRA description of program element "monitoring and trending" for the Small Bore Class 1 Piping Inspection Program. The staff notes that the applicant's changes replace the previous reference to Information Notice 97-46 with a more general statement that applicable OE will be included in determining the actual inspection locations.

Based on its review, the staff finds the applicant's response to RAI B.2.31-3 acceptable because the applicant has amended the LRA to eliminate the reference to IN 97-46, but, continue to state that applicable OE will be considered. Therefore, the staff's concern described in RAI B.2.31-3 is resolved.

In describing the Small Bore Class 1 Piping Inspection, under program element "detection of aging effects" in LRA Section B.2.31, the applicant stated that it found cracking due to vibrational fatigue of small bore piping and is performing augmented inspections as part of the Inservice Inspection Program.

In RAI B.2.31-4, dated June 23, 2008, the staff requested that the applicant Identify the small bore piping components that experienced the vibrational-induced cracks and the augmented inspection techniques that resulted in the detection of the cracking in the piping components. Additionally, the staff requested that the applicant clarify whether it has taken appropriate corrective actions either to repair the flaw indications in the components or to replace the impacted components, and identify whether those components' locations will be reinspected in the future. If these components will be reinspected in the future, identify and provide technical justification for the inspection technique and frequency that will be used.

In the response to RAI B.2.31-4, dated July 25, 2008, the applicant stated:

> SSES experienced nine socket weld failures (leaks) between 1992 and 2005. All of the leaks were on small bore piping attached to the Unit 2 reactor recirculation system. No socket weld failures have been experienced on Unit 1. All of the leaking welds were cut out and replaced, or entirely eliminated by modification of the pipeline.
>
> In response to the socket weld failures experienced at SSES and other plants, the SSES ISI group developed a shear wave ultrasonic (UT) inspection technique to volumetrically inspect socket welds. The shear wave UT is an augmented technique that has been used extensively during plant outages since 2000 to inspect welds that had been determined to be at-risk for vibrational fatigue due to their proximity to a vibration source (e.g., a recirculation pump).
>
> Every weld with a crack-like indication was either cut-out and replaced or eliminated by a piping modification. Numerous modifications were made to replace socket-welded fittings with solid pipe (using pipe bends, instead of fittings) and to alter the natural frequency of the piping to avoid excitation by the vibration source. All new socket welds were made with the EPRI 2x1 configuration to improve fatigue resistance. To date, none of the 2x1 welds have resulted in a leaking crack at SSES.
>
> Recent inspection results have indicated a substantial reduction in the number of indications. PPL is confident that vibrational fatigue on the subject piping welds has been successfully addressed. As such, the necessity to continue volumetric inspections under the augmented ISI program is currently being evaluated.

Based on its review, the staff finds the applicant's response to RAI B.2.31-4 acceptable because the applicant has provided detailed summary information about its methodology for and history of small bore pipe examination, and because the applicant's response supports a conclusion that previous problems with vibrational fatigue on small bore piping welds have been successfully addressed. Therefore, the staff's concern described in RAI B.2.31-4 is resolved.

The staff notes that in a letter dated September 30, 2008, the applicant revised LRA Section B.2.31 by deleting the discussions related to small bore piping failures attributed to vibrational (high-cycle) fatigue. The applicant made this change because the Small Bore Class 1 Piping Inspection Program is credited with managing age-related cracking due to stress corrosion or thermal and mechanical loading, but not with managing cracking due to high-cycle, vibrational fatigue, which is a short-term failure mechanism, not a long term aging mechanism. The staff finds this LRA change acceptable because it deletes from the LRA the discussion of a short-term failure mechanism that is not managed by the Small Bore Class 1 Inspection Program, and because the Small Bore Class 1 Inspection Program, including all revisions to the LRA, is consistent with the corresponding AMP as described in the GALL Report.

Based on its review, and resolution of the related RAIs as described above, the staff finds the

Small-Bore Class 1 Piping Inspection Program consistent with program elements of GALL AMP XI.M35 and; therefore, is acceptable.

Operating Experience. The applicant stated that the Small Bore Class 1 Piping Inspection Program is a new one-time inspection activity for which there is no OE and that inspection methods will be consistent with accepted industry practices. For this program and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued a generic RAI.

In RAI B.2.1, dated June 10, 2008, the staff requested that the applicant commit to provide documentation of plant-specific operating for staff review, after the program has been implemented, but, prior to entering the period of extended operation.

In the response to RAI B.2.1, dated July 8, 2008, the applicant stated that OE for new AMPs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant further stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, Quality Assurance Program. Results will be subject to staff review during regional inspections, under existing staff inspection modules. The applicant also stated that one-time inspections will be performed prior to entry into the period of extended operation to confirm the effectiveness of existing AMPs, and that these programs are subject to review under NRC Inspection Procedure 71003, “Post-Approval Site Inspection for License Renewal.”

The staff noted the applicant’s statement that inspection methods will be consistent with industry practices is consistent with the “operating experience” program element for GALL AMP XI.M35. The staff also noted that post-approval site inspections provide an opportunity for staff to review and assess the effectiveness of the applicant’s Small Bore Class 1 Piping Inspection Program, after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on internal and external experience, will capture OE to support the conclusion that the effects of aging are adequately managed.

On this basis, the staff confirms that the “operating experience” program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable and concludes that a separate commitment is not necessary.

UFSAR Supplement. The applicant provides the UFSAR supplement summary for the Small Bore Class 1 Piping Inspection Program in LRA Section A.1.2.44, Commitment No. 27. The staff reviewed this section, as revised in response to RAI B.2.31-1, and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.1-2. The staff also notes that the applicant has committed to implement the Small Bore Class 1 Piping Inspection Program for aging management of applicable components during the 10-years prior to 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 the review of the applicant’s Small Bore Class 1 Piping Inspection Program, the staff finds that, after incorporation of all LRA and program revisions made in response to the staff’s RAIs, all program elements are consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.19 Inservice Inspection Program (ISI) Program - IWE

Summary of Technical Information in the Application. In LRA Section B.2.34, the applicant described the existing Inservice Inspection (ISI) Program - IWE as consistent with GALL AMP XI.S1 “ASME Section XI, Subsection IWE.”

The applicant stated that the Inservice Inspection (ISI) Program - IWE is implemented through plant procedures which provide for ISI of Class MC and metallic liners of Class CC components. Section 50.55a of 10 CFR requires the use of the examination requirements in the ASME Code, Section XI, Subsection IWE, for steel liners of concrete containments and other containment components. The applicant also stated that it has implemented ASME Code Section XI, Subsection IWE, 1998 Edition with the 2000 Addenda, and will adopt new ASME Code editions and addenda, consistent with the provisions of 10 CFR 50.55a, during the period of extended operation.

Staff Evaluation. During the onsite review, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed the applicant’s ASME Code Section XI, Subsection IWE Program onsite basis documents to determine their consistency with GALL AMP XI.S1. Specifically, the staff reviewed the program elements and associated onsite documents and found that they are consistent with the GALL Report. On the basis of its review, the staff concludes that the applicant’s Inservice Inspection (ISI) Program - IWE provides assurance that the steel containments (Class MC) and steel liners for concrete containments (Class CC) will be adequately managed.

Based on its review, the staff finds the applicant’s Inservice Inspection (ISI) Program - IWE consistent with the program elements of GALL AMP XI.S1 and; therefore, is acceptable.

Operating Experience. The staff also reviewed the applicant’s OE described in LRA Section B.2.34 and some of the applicant’s onsite basis documents, including some samples of condition reports, and interviewed the applicant’s technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. In the application and during the onsite review, the applicant explained that the OE of the Inservice Inspection (ISI) Program - IWE activities shows no adverse trend of program performance. The staff noted that previous SSES IWE inspections have identified age-related degradation including flaking, discoloration, light to heavy pitting, and corrosion. The staff also noted that underwater containment suppression chambers were inspected by VT-3 certified divers. Metal loss appears to have progressed slowly and localized pitting is below the threshold values. The staff further noted that deficiencies were further evaluated and corrected by the applicant in accordance with the Inservice Inspection (ISI) Program – IWE. The documents reviewed by the staff provided assurance that the program is capturing degradation and correcting it in accordance with ASME Code Section XI. The applicant also established periodic IWE inspections in which all accessible surfaces of the steel containments and steel liners for concrete containments are visually inspected for the duration of plant operation. The staff’s OE review has concluded that administrative controls are effective in detecting age-related degradation and in initiating corrective action. The staff did not identify any age-related related issues not bounded by the industry OE.

On this basis, the staff confirms that the “operating experience” program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Inservice Inspection (ISI) Program – IWE in LRA Section A.1.2.24, Commitment No. 29. 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 review of the applicant’s Inservice Inspection (ISI) Program - IWE, 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it adequately describes the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.20 Inservice Inspection (ISI) Program - IWL

Summary of Technical Information in the Application. In LRA Section B.2.35, the applicant described the existing Inservice Inspection (ISI) Program - IWL as consistent with GALL AMP XI.S2, “ASME Section XI, Subsection IWL.”

The Inservice Inspection (ISI) Program - IWL consists of periodic visual inspections of the reinforced concrete containment structures for Units 1 and 2. The applicant stated in the LRA that no significant aging effects have been identified for the concrete containment structures.

Staff Evaluation. During its review, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed the applicant’s Inservice Inspection (ISI) Program - IWL onsite basis documents to determine their consistency with GALL AMP XI.S2. Specifically, the staff reviewed the program elements and associated onsite documents and found that they are consistent with the GALL Report. On the basis of its review, the staff concludes that the applicant’s Inservice Inspection (ISI) Program - IWL provides assurance that the reinforced concrete containment structures will be adequately managed.

Based on its review, the staff finds the applicant’s Inservice Inspection (ISI) Program - IWL consistent with the program elements of GALL AMP XI.S2 and; therefore, is acceptable.

Operating Experience. The staff also reviewed the applicant’s OE described in LRA Section B.2.35 and some of the applicant’s onsite basis documents, including inspection data and summaries, and interviewed the applicant’s technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. In the application and during the onsite review, the applicant explained that the OE of the ISI Program - IWL activities shows no adverse trend of program performance. The staff noted that previous IWL inspections have identified minor exterior surface cracks on the containment surface. The staff also noted that deficiencies were documented, further evaluated, and corrected, if necessary, in accordance with the ISI Program – IWL. For example, visual examinations in 2000 discovered surface cracking on the containment exterior. The applicant provided documentation showing the cracking to be less than the allowable values in accordance with American Concrete

Institute (ACI) 224R, Table 4.1 and acceptable pursuant to its applicable plant specification. The staff further noted that the applicant established periodic containment concrete IWL inspections in which all accessible external surfaces containment buildings are visually inspected for the duration of plant operation. The staff's OE review has concluded that administrative controls are effective in detecting age-related degradation and initiating corrective action. The staff did not identify any age-related issues not bounded by the industry OE.

On this basis, the staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Inservice Inspection (ISI) Program – IWL in LRA Section A.1.2.26, Commitment No. 31. 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 the review of the applicant's Inservice Inspection (ISI) Program – IWL, 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.21 Inservice Inspection (ISI) Program - IWF

Summary of Technical Information in the Application. In LRA Section B.2.36, the applicant described the existing Inservice Inspection (ISI) Program - IWF as consistent with GALL AMP XI.S3, "ASME Section XI, Subsection IWF."

The applicant stated that the Inservice Inspection (ISI) Program - IWF is implemented through plant procedures, which provide for periodic visual ISI of Class 1, 2, and 3 component supports for loss of mechanical function and material. Section 50.55a of 10 CFR requires the use of the examination requirements pursuant to ASME Code, Section XI, Subsection IWF, for ASME Code Class 1, 2, 3, and MC piping and components and their associated supports. The applicant also stated that it has implemented ASME Code Section XI, Subsection IWF, 1998 Edition with the 2000 Addenda, and will adopt new ASME Code editions and addenda, consistent with the provisions of 10 CFR 50.55a, during the period of extended operation.

Staff Evaluation. During its onsite review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed the applicant's Inservice Inspection (ISI) Program - IWF onsite basis documents to determine their consistency with the GALL AMP XI.S3. Specifically, the staff reviewed the program elements and associated onsite documents and found that they are consistent with the GALL Report. On the basis of the review, the staff concludes that the applicant's Inservice Inspection (ISI) Program - IWF provides assurance that the ASME Code Class 1, 2, and 3 component supports will be adequately managed.

Based on its review, the staff finds the applicant's Inservice Inspection (ISI) Program - IWF consistent with the program elements of GALL AMP XI.S3 and; therefore, is acceptable.

Operating Experience. The staff also reviewed the applicant's OE described in the LRA Section B.2.36 and some of the applicant's onsite basis documents, including some samples of condition reports (CR), and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. In the application and during the onsite review, the applicant explained that the OE of the Inservice Inspection (ISI) Program - IWF activities shows no adverse trend of program performance. The staff noted in the LRA OE that previous IWF inspections have identified non aging-related degradation such as bent rods on spring can supports and sway struts. Deficiencies were further evaluated and corrected in accordance with the Inservice Inspection (ISI) Program – IWF. During its onsite review, the staff requested that the applicant provide more information about the bent spring can supports described in the OE of the LRA. The applicant provided the CRs which detailed the finding and the resolution. The staff reviewed the documents which provided assurance that the applicant's program captures degradation and corrects it, in accordance with ASME Code Section XI. The applicant has established periodic IWF inspections in which ASME Code Class 1, 2, and 3 component supports are visually inspected for the duration of plant operation. The staff's OE review concludes that the applicant's administrative controls are effective in detecting age-related degradation and initiating corrective action. The staff did not identify any age-related related issues not bounded by the industry OE.

On this basis, the staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Inservice Inspection (ISI) Program – IWF in LRA Section A.1.2.25, Commitment No. 30. 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 the review of the applicant's Inservice Inspection (ISI) Program – IWF, 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it adequately describes the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.22 Containment Leakage Rate Test Program

Summary of Technical Information in the Application. In LRA Section B.2.37, the applicant described the existing Containment Leakage Rate Test Program as consistent with the GALL AMP XI.S4, "10 CFR Part 50, Appendix J." The applicant uses Option B, the performance-based approach, to implement the requirement of containment leak rate monitoring and testing.

The 10 CFR Part 50, Appendix J Program monitors leakage rates through the containment pressure boundary, including penetrations and access openings. Containment leak rate tests assure that leakage through the primary containment and systems and components penetrating primary containment does not exceed the acceptance criteria limits.

Staff Evaluation. During its onsite review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed the applicant's Containment Leakage Rate Test Program onsite basis documents to determine their consistency with the GALL AMP XI.S4. Specifically, the staff reviewed the program elements and associated onsite documents and found that they are consistent with the GALL Report. On the basis of the review, the staff concludes that the applicant's Containment Leakage Rate Test Program provides assurance that leakage through primary containment and system and components penetrating primary containment will be adequately managed.

Based on the review, the staff finds the applicant's Containment Leakage Rate Test Program consistent with the program elements of GALL AMP XI.S4 and; therefore, is acceptable.

Operating Experience. The staff also reviewed the applicant's OE described in LRA Section B.2.37 and some of the applicant's onsite documents, including some samples of condition reports, and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. The staff found that the most recent containment structure integrated leak rate tests were performed in April 2006 and 2007 for Units 1 and 2, respectively. The results were below the plant limits found in the technical specifications, and demonstrate the leak tightness of the containments. The staff noted that there were no instances of Appendix J test failures due to causes other than valve or flange seat leakage. For these failures, all conditions were evaluated and corrected. The staff also reviewed a CR which the applicant documented corrosion discovered on an access hatch during the IWE inspection. The corrosion was removed and all four door seals were replaced. The staff did not identify any age-related issues not bounded by the industry OE.

On this basis, the staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Containment Leakage Rate Test Program in LRA Section A.1.2.15, Commitment No. 32. 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 the review of the applicant's Containment Leakage Rate Test 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it adequately describes the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.23 Non-EQ Electrical Cables and Connections Visual Inspection Program

Summary of Technical Information in the Application. In LRA Section B.2.41, the applicant described the Non-Environmental Qualification (EQ) Electrical Cables and Connections Visual Inspection Program as a new program that is consistent with the GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The applicant stated that this AMP will provide reasonable assurance that the applicable electrical components will perform their intended function(s) for the period of extended operation. The applicant also stated that the program provides for the periodic visual inspection of accessible, non-EQ electrical cables and connections, in order to determine if age-related degradation is occurring, particularly in plant areas with high temperatures and/or high radiation levels.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed and compared the "scope of program," "preventative actions," "parameters monitored/detected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "operating experience" program elements of the AMP to the corresponding program element criteria in the GALL AMP XI.E1.

The staff compared the program elements in the applicant's program to those in GALL AMP XI.E1 to verify that the program elements in the applicant's AMP, which the LRA identified as consistent with the GALL Report, were consistent with the corresponding program element criteria recommended in the program elements of the GALL AMP XI.E1. The staff determined that additional information was required to complete its review.

The GALL AMP XI.E1 considers the technical information and guidance provided in NUREG/CR-5643, Institute for Electrical and Electronic Engineers (IEEE) Standard P1205, SAND 96-0344, and EPRI TR-109619.

In LRA Section B.2.41, the applicant stated that this program is consistent with the GALL Report; however, the applicant did not provide technical information and guidance as referenced in the GALL AMP XI.E1.

In RAI B.2.41-1, dated July 3, 2008, the staff requested that the applicant provide the specific industry guidance or explain why the guidance was not necessary.

In its response to RAI B.2.41-1, dated August 05, 2008, the applicant stated that the technical documents listed in GALL AMP XI.E1 (*e.g.,* NUREG/CR-5643, IEEE Standard P1205, SAND96-0344, and EPRI TR-109619) provide information pertinent to plant environmental conditions, environmental effects (particularly with regard to adverse environmental conditions), evaluation of environmental conditions and effects, degradation mechanisms, and aging effects. The applicant also stated that the information is relevant to the understanding of electrical cable aging mechanisms and effects, and is also relevant to potential inspection methods necessary to identify degradation. The applicant further stated that the technical guidance contained in these staff and industry reports will be used as input to develop this AMP.

Based on the review, the staff finds the applicant's response to RAI B.2.41-1 acceptable because the applicant has identified the appropriate references that are consistent with those in the GALL AMP XI.E1. Therefore, the staff's concern described in RAI B.2.14-1 is resolved.

The GALL XI.E1 states that an adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cable. The staff reviewed the plant basis document associated with the Non-EQ Electrical Cables and Connections Visual Inspection Program and noted that the applicant did not define the criteria for an adverse localized environment.

In RAI B.2.41-2, dated July 3, 2008, the staff requested that the applicant discuss how an adverse localized environment is determined based on the most limiting service environment of cables (i.e., radiation, temperature, and moisture) within the scope of the GALL AMP XI.E1. The GALL AMP XI.E1 states conductor insulation material used in electrical cables and connection may degrade in adverse localized environments. The exposure of electrical cables and connections to adverse localized environments caused by heat, or radiation can result in reduced insulation resistance.

In the response to RAI B.2.41-2, dated August 05, 2008, the applicant stated that adverse localized environments are identified by using a combination of existing information and plant walk downs. The applicant further stated that an adverse localized environment typically occurs when cables are routed in proximity to a source of heat or radiation, or are exposed to significant moisture. The applicant also stated that Information sources that can be used to identify potential adverse localized environments include, plant design information, experience and knowledge of plant personnel, radiological survey maps, and plant OE records. Plant walk downs guided by the information from these sources, along with the use of thermography to identify heat sources, will determine the adverse localized environments.

The staff found the applicant's response unacceptable because the applicant did not clearly identify the threshold condition (i.e. temperature, radiation) at which the localized environment is considered adverse. In a follow up conference call on October 10, 2008, the staff requested that the applicant define the most limiting temperature and radiation dose values that will be used to identify an adverse localized environment.

In a letter dated October 31, 2008, the applicant responded with a supplement to RAI B.2.41-2 and stated that the most restrictive 60-year service limiting temperature for electrical insulating materials in use at SSES is 112^{o}F for polyvinyl chloride. The most restrictive 60-year service limiting radiation dose for electrical insulating materials in use at SSES is 5×10^{4} rads for fluorinated ethylene propylene. These values will be used as the thresholds for evaluation to identify adverse localized environments.

Based on the review, the staff finds the applicant's response to RAI B.2.41-2, in addition to the supplemental response acceptable because the applicant has clearly indentified the threshold condition (i.e. temperature, radiation) at which the localized environment is considered adverse. Therefore, the staff's concern described in RAI B.2.41-2 is resolved.

In addition to the requirements of 10 CFR Part 50, Appendix B, the "corrective actions" program element in the electrical GALL Report AMPs recommends certain actions, such as making a determination of whether the same condition or situation is applicable to other accessible or inaccessible cables and connections. In the LRA, the applicant stated that the AMPs are consistent with the GALL Report and referred to a corrective action element in LRA Section B.1.3 that is common to all AMPs. The corrective actions described in LRA Section B.1.3 do not contain certain recommendations described in GALL AMP XI.E1.

In RAI Q3, dated July 3, 2008, the staff requested that the applicant explain in detail how the generic corrective actions in LRA Section B.1.3 are consistent with GALL AMP XI.E1.

In the response to RAI Q3, dated August 05, 2008, the applicant stated that for the Non-EQ Electrical Cables and Connections Visual Inspection Program, all unacceptable visual indications of cable and connection jacket surface anomalies will be subject to an engineering evaluation. The applicant further stated that evaluation will consider the age and OE of the component, as well as the severity of the anomaly and whether the anomaly has previously been correlated to degradation of the conductor insulation or connections. The applicant also stated that corrective actions may include, but are not limited to, testing, shielding or otherwise changing the environment, or relocation and/or replacement of the affected cable or connection. When an unacceptable condition or situation is identified, the applicant stated that it determines whether the same condition or situation is applicable to other cables or connections within the scope of license renewal.

Based on the review, the staff finds the applicant's response to RAI Q3 acceptable because the applicant has adequately explained that the corrective actions it has identified will include actions as described in GALL AMP XI.E1. Therefore, the staff concern described in RAI Q3 is resolved.

Based on the review of the information contained in the LRA and the applicant's responses to RAIs B.2.41-1, B.2.41-2 and Q3, the staff determines that the Non-EQ Electrical Cable & Connections Visual Inspection Program is consistent with the program elements of GALL AMP XI.E1 and; therefore, is acceptable.

Operating Experience. The staff also reviewed the applicant's OE in the onsite plant basis document. The staff confirmed that the applicant has correctly identified the appropriate root causes of cable aging and has taken appropriate corrective actions.

However, under the "operating experience" program element in the Non-EQ Electrical Cables and Connections Visual Inspection Program, the applicant stated that the AMP is a new program for which there is no SSES plant-specific OE.

In RAI Q1, dated July 3, 2008, the staff requested that the applicant describe plant-specific OE associated with cables and connections in this AMP and explain how the new program will manage the aging effects of cable and connection insulation.

In the response to RAI Q1, dated August 5, 2008, the applicant included the following OE: (a) during routine preventive maintenance activities in 2000, cables connected to moisture separator level switches were found to be brittle and cracked due to excessive heat and the damaged cables were replaced and (b) in 2002, instrumentation cables connected to a thermocouple in the main steam tunnel were found to be heat damaged and brittle. The damaged section of cable was replaced.

Based on the review, the staff finds the applicant's response to RAI Q1 acceptable because the applicant has provided an adequate description of plant-specific OE associated with the cables and connectors in the Non-EQ Electrical Cables and Connections Visual Inspection Program. The staff determines that the OE is consistent with and bounded by those in the GALL AMP XI.E1. Therefore, the staff's concern described in RAI Q1 is resolved.

On this basis, the staff determines that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Non-EQ Electrical Cable and Connections Visual Inspection Program in LRA Section A.1.2.35, Commitment No. 36. The staff notes that SRP-LR Table 3.6-2 identifies when an inspection will be implemented and how often the inspection will be performed. The UFSAR supplement for the Non-EQ Electrical Cables and Connections Visual Inspection Program does not provide the frequency of inspection.

In RAI Q2, dated July 3, 2008, the staff requested that the applicant provide the frequency of inspection in the UFSAR supplement.

In the response to RAI Q2, dated August 05, 2008, the applicant included the inspection frequency in the UFSAR supplement, in agreement with the Non-EQ Electrical Cables and Connections Visual Inspection Program.

Based on the review, the staff finds the applicant's response to RAI Q2 acceptable because the applicant had revised the UFSAR supplement to include the frequency of inspection. Therefore, the staff's concern described in RAI Q2 is resolved.

On this basis, the staff determines that the UFSAR supplement provides an adequate summary description of the applicant's Non-EQ Electrical Cable and Connections Visual Inspection, as required by 10 CFR 54.21(d). The staff notes that the applicant has committed (Commitment No. 36) to implement this AMP prior to the period of extended operation.

Conclusion. On the basis of the review of the applicant's Non-EQ Electrical Cable and Connections Visual Inspection Program and the applicant's responses to RAIs B.2.41-1, B.2.41-2, Q1, Q2, and Q3, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.24 Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program

Summary of Technical Information in the Application. In LRA Section B.2.42, the applicant described the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program as a new program consistent with the GALL AMP XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR50.49 Environmental Qualification Requirements Used in Instrumentation Circuits." The applicant stated that the purpose of this AMP is to manage the age-related degradation associated with non-EQ, low current instrumentation cables and connections within the scope of license renewal. The applicant also stated that this program applies to in-scope, non-EQ electrical cables and connections used in neutron monitoring circuits with sensitive, low-current signals. The sensitive nature of these circuits is such that visual inspection alone may not detect degradation to the insulation resistance function of the conductor insulation.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed and compared the "scope of program," "preventive actions," "parameters monitored/detected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "operating experience" program elements of the AMP to the corresponding program element criteria in GALL AMP XI.E2.

The staff compared the programs elements in the applicant's AMP to those in the GALL AMP XI.E2. The staff verified that the program elements, which the LRA identified as consistent with the GALL Report, were consistent with the corresponding program element criteria recommended in GALL AMP XI.E2. However, the staff determined that additional information was required to complete its review.

The GALL AMP XI.E2 considers the technical information and guidance provided in NUREG/CR-5643, IEEE Standard P1205, SAND96-0344 and EPRI TR-109619. In LRA Section B.2.42, the applicant stated that its program is consistent with the GALL Report, but did not provide any information on industrial technical guidance.

In RAI B.2.42-1, dated July 3, 2008, the staff requested that the applicant provide specific technical guidance which it will use to develop this AMP.

In its response to RAI B.2.42-1, dated August 05, 2008, the applicant stated that the technical documents listed in GALL AMP XI.E2 (*e.g.,* NUREG/CR-5643, IEEE Standard P1205, SAND 96-0344, and EPRI TR-109619) provide information pertinent to plant environmental conditions, environmental effects (i.e., adverse environmental conditions), evaluation of environmental conditions and effects, degradation mechanisms, and aging effects. The applicant also stated that the information is relevant to the understanding of electrical cable aging mechanisms and effects, and is also relevant to potential inspection methods to identify degradation. The applicant further stated that technical guidance contained in these staff and industry reports will be used as input to develop this AMP.

Based on the review, the staff finds the applicant's response to RAI B.2.42-1 acceptable because the applicant has confirmed that it will use industrial guidance to develop the AMP and that the guidance identified by the applicant is consistent with that in GALL AMP XI.E2. Therefore, the staff's concern described in RAI B.2.42-1 is resolved.

The GALL AMP XI.E2 states that a proven cable system test for detecting deterioration of the insulation system such as insulation resistance tests, time domain reflectometry tests, or other testing judged to be effective in determining cable insulation condition as justified in the application, should be performed. In LRA Section B.2.42, under the same element, the applicant stated that the testing methodology will be specified prior to the first test.

In RAI B.2.42-2, dated July 3, 2008, the staff requested that the applicant provide the type of tests that it will use to detect degradation of insulation in high-voltage, and in low-level signal instrumentation circuits.

In its response to RAI B.2.42-2, dated August 05, 2008, the applicant stated that this is a new program that will be implemented consistent with the GALL Report. Therefore, as recommended in the GALL Report, a proven cable system test for detecting degradation of insulation such as, insulation resistance testing, time domain reflectometry, or other suitable test, will be used. The applicant further stated that the test method will be selected prior to performance of the first test and will be a test type consistent with the recommendations in the GALL Report.

Based on its review, the staff finds the applicant's response to RAI B.2.42-2 acceptable because the applicant has identified proven methods of testing that it will use and that these methods are consistent with those recommended in the GALL AMP XI.E2. Therefore, the staff's concern described in RAI B.2.42-2 is resolved.

In addition to the requirements of 10 CFR Part 50, Appendix B, the "corrective actions" program element in the electrical GALL Report AMPs recommends certain actions, such as making a determination of whether the same condition or situation is applicable to other accessible or inaccessible cables and connections. In the LRA, the applicant stated that its AMPs are consistent with the GALL Report and referred to a corrective action element in LRA Section B.1.3, common to all AMPs. The staff determined that the corrective actions described in this LRA section may not contain certain recommendations described in the GALL AMP XI.E2.

In RAI Q3, dated July 3, 2008, the staff requested that the applicant explain in detail how the generic corrective actions in LRA Section B.1.3 are consistent with GALL AMP XI.E2.

In its response to RAI Q3, dated August 05, 2008, the applicant stated for the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program, corrective actions such as recalibration and circuit trouble-shooting are implemented when calibration or surveillance results do not meet the acceptance criteria. The applicant performs an engineering evaluation when the test results do not meet the acceptance criteria. The applicant also stated that the evaluation will consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes, the corrective actions required, and the likelihood of recurrence.

Based on its review, the staff finds the applicant's response to RAI Q3 acceptable because the applicant has identified corrective actions that are consistent with those in GALL AMP XI.E2. Therefore, the staff's concern described in RAI Q3 is resolved.

Based on its review of the information contained in the LRA and the applicant's responses to RAIs B.2.42-1, B.2.42-2 and Q3, the staff finds the applicant's Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program consistent with the program elements of GALL AMP XI.E2 and; therefore, is acceptable.

Operating Experience. The staff reviewed CRs as part of its onsite review of the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program. The staff determined that the CRs demonstrate that the applicant has implemented appropriate corrective actions. However, the applicant states that the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is a new program for which there is no plant-specific OE.

In RAI Q1, dated July 3, 2008, the staff requested that the applicant describe plant-specific OE associated with cables and connections in this AMP and explain how the new program will manage the aging effects of cable and connection insulations used in low-current instrumentation circuits.

In its response to RAI Q1, dated August 05, 2008, the applicant stated that the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program has not been implemented, but the following example of OE demonstrates that the aging effect of interest in this AMP (i.e., reduction in insulation resistance), can be, and has been, successfully detected. During routine plant maintenance activities in 2003, two Unit 2 local power range monitoring cables were identified with lower than acceptable insulation resistance. The applicant replaced those cables. GALL AMP XI.E2 states that exposure of electrical cables to adverse localized environments caused by heat, radiation, or moisture can result in reduced insulation resistance. Reduced insulation resistance caused an increase in leakage currents between conductors and from individual conductor to ground. A reduction in insulation resistance is a concern for circuits with sensitive, high-voltage, low-level signals such as radiation monitoring and nuclear instrumentation circuits, because a reduced insulation resistance may contribute to signal inaccuracies.

Based on its review, the staff finds the applicant's response to RAI Q1 acceptable because the applicant has adequately described the plant-specific OE associated with cables and connections in this AMP and has sufficiently explained how the new program will manage the aging effects of cable and connection insulations used in low-current instrumentation circuits. The staff determines that reduced insulation resistance is the aging effect of sensitive instrumentation cables installed in an adverse localized environment. This aging effect is bounded by that in the GALL AMP XI.E2. Therefore, the staff's concern described in RAI Q1 is resolved.

On the basis of its review, the staff determines that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary description for the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program in LRA Section A.1.2.34, Commitment No. 37. The staff notes that SRP-LR Table 3.6-2 identifies when an inspection will be implemented and how often the inspection will be performed. The applicant's UFSAR supplement for the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program does not provide the frequency of inspection.

In RAI Q2, dated July 3, 2008, the staff requested that the applicant provide the frequency of inspection in the UFSAR supplement.

In its response to RAI Q2, dated August 05, 2008, the applicant provided the inspection frequency, as described in the Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program, in the UFSAR supplement. The staff finds that UFSAR supplement summary description in LRA Section A.1.2.34 provides an adequate summary description of the applicant's Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program, as required by 10 CFR 54.21(d). The staff confirms the applicant's commitment (Commitment No. 37) to implement this AMP prior to the period of extended operation.

Conclusion. On the basis of its technical review of the applicant's Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program, the staff finds all program elements consistent with the GALL Report. Upon reviewing the LRA and the applicant's responses to RAIs B.2.42-1 B.2.42-2, Q1, Q2, and Q3, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and. therefore, is acceptable.

3.0.3.1.25 Non-EQ Inaccessible Medium-Voltage Cables Program

Summary of Technical Information in the Application. In LRA Section B.2.43, the applicant described the new Non-EQ Inaccessible Medium-Voltage Cables Program as consistent with GALL AMP XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements." The applicant also stated that this AMP will manage the aging of non-EQ inaccessible medium-voltage electrical cables subject to wetting, within the scope of license renewal. The applicant further stated that the program provides for the periodic testing of non-EQ inaccessible medium-voltage electrical cables, in order to determine if age-related degradation is occurring, and includes provisions for the inspection of associated manholes to identify any collection of water.

Staff Evaluation. During the audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed and compared the “scope of program,” “preventive actions,” “parameters monitored/detected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and operating experience” program elements of the AMP to GALL AMP XI.E3.

The staff compared the program elements in the applicant’s program to those in the GALL AMP XI.E3 and verified that the program elements in the applicant’s AMP, which the applicant identified as consistent with the GALL Report, were consistent with the GALL AMP XI.E3. However, the staff determined that additional information was required to complete its review.

In LRA Section B.2.43, under the “scope of program” element, the applicant stated that this program applies to six cables associated with the offsite power supply for SSES. The applicant also stated that these are the only inaccessible medium-voltage cables that are within the scope of license renewal and are exposed to significant moisture and significant voltage. Significant voltage is defined by the GALL Report as any device or cable that is energized more that 25% of the time. The staff noted that the RHR and emergency service water (ESW) pump cables could be subjected to significant moisture and significant voltage.

In RAI B.2.43-1, dated July 3, 2008, the staff requested that the applicant explain why these cables are not within the scope of the Non-EQ Inaccessible Medium-Voltage Cables Program.

In the response to RAI B. 2.43-1, dated August 5, 2008, the applicant stated that the cables for the RHR pump motors are not within the scope of the Non-EQ Inaccessible Medium-Voltage Cables Program because they are not routed underground and are not exposed to significant moisture. The cables for the RHR service water (RHRSW) and ESW pump motors are not included in the scope of the Non-EQ Inaccessible Medium-Voltage Cables Program because they are energized less that 25% of the time. The applicant also stated that as described in the GALL AMP XI.E3, this AMP applies to inaccessible medium-voltage cables within the scope of license renewal that are exposed to significant moisture, simultaneously with significant voltage. The GALL Report states that significant moisture is defined as periodic exposures to moisture that last more than a few days, and significant voltage is defined as being subject to system voltage more than 25% of the time. The applicant concluded that, because the RHR, RHRSW, and ESW pump motor cables are either not exposed to significant moisture, or to significant voltage, they are excluded from the scope of the Non-EQ Inaccessible Medium-Voltage Cables Program.

Based on the review, the staff finds the applicant’s response to RAI B.2.43-1 acceptable because the applicant has adequately explained that the RHR, RHRSW, and ESW pump motor cables are either not exposed to significant moisture or to significant voltage; therefore, they are not required to be within the scope of the Non-EQ Inaccessible Medium-Voltage Cables Program. Therefore, the staff’s concern described in RAI B.2.43-1 is resolved.

The GALL AMP XI.E3 considers the technical information and guidance provided in NUREG/CR-5643, IEEE Standard P1205, SAND96-0344 and EPRI TR-109619. In LRA Section B.2.43, the applicant stated that the program is consistent with the GALL Report and yet, it did not provide any information on industrial technical guidance.

In RAI B.2.43-3, dated July 3, 2008, the staff requested that the applicant provide technical guidance for the Non-EQ Inaccessible Medium-Voltage Cables Program or provide a justification for why this guidance is not necessary.

In the response to RAI B.2.43-3, dated August 5, 2008, the applicant stated that the technical documents listed in GALL AMP XI.E3 (e.g., NUREG/CR-5643, IEEE Standard P1205, SAND96-0344, and EPRI TR-109619) provide information pertinent to plant environmental conditions, environmental effects (i.e., adverse environmental conditions), evaluation of environmental conditions and effects, degradation mechanisms, and aging effects. The applicant further stated that the information is relevant to understanding electrical cable aging mechanisms and effects, and is also relevant to potential testing methods to identify degradation. The technical guidance contained in these staff and industry reports will be used as input to develop this AMP.

Based on the review, the staff finds the applicant's response to RAI B.2.43-3 acceptable because the applicant has provided the technical documents listed in the GALL AMP XI.E3 as its references. Therefore, the staff's concern described in RAI B.2.43-3 is resolved.

The GALL AMP XI.E3, under the "detection of aging effects" program element, states that the specific type of test is to be a proven test for detecting deterioration of the insulation system due to wetting (i.e., power factor, partial discharge, or polarization index), as described in EPRI TR-103834-P1-2, or other testing that is state-of-the-art at the time of the test is performed. In LRA Section B.2.43, under the same attribute, the applicant stated that the program will utilize a proven test for detecting deterioration of the cable insulation due to wetting and energization, and will reflect the actual test methodology prior to the initial performance of the cable testing.

In RAI B.2.43-4, dated July 3, 2008, the staff requested that the applicant describe the testing methodology for detecting deterioration of the cable insulation under this AMP.

In the response to RAI B.2.43-4, dated August 5, 2008, the applicant stated that this is a new program that will be implemented consistent with the GALL Report. The applicant further stated that, as recommended in the GALL Report, a proven test for detecting deterioration of the insulating system (i.e., such as, power factor, partial discharge, polarization index), as described in EPRI TR103834-P1-2, or other state-of-the-art testing, will be used. The test method will be selected prior to performance of the first test and will be a test-type consistent with the recommendations of the GALL Report.

Based on its review, the staff finds the applicant's response to RAI B.2.43-4 acceptable because the applicant has reasonably described the testing methodology for detecting deterioration of the cable insulation under this AMP, which is consistent with those recommended in the GALL AMP XI.E3. Therefore, the staff's concern described in RAI B.2.43-4 is resolved.

In addition to the requirements of 10 CFR Part 50, Appendix B, the "corrective actions" program element in the electrical GALL AMPs recommends certain actions, such as making a determination of whether the same condition or situation is applicable to other accessible or inaccessible cables and connections. In the LRA, the applicant stated that its AMPs are consistent with the GALL Report and referred to a corrective action element in LRA Section B.1.3, common to all AMPs. The staff determined that the corrective actions described in LRA Section B.1.3 may not contain certain recommendations described in the GALL AMP XI.E3.

In RAI Q3, dated July 3, 2008, the staff requested that the applicant explain in detail how the generic corrective actions in LRA Section B.1.3 are consistent with GALL AMP XI.E3.

In its response to RAI Q3, dated August 5, 2008, the applicant stated that for the Non-EQ Inaccessible Medium-Voltage Cables Program, an engineering evaluation is performed in order to ensure that the intended function of the electrical cables can be maintained consistent with the CLB, when the test acceptance criteria are not met. The evaluation will consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes, the corrective actions required, and the likelihood of recurrence. When an unacceptable condition or situation is identified, a determination will be made as to whether the same condition or situation is applicable to other in-scope medium-voltage cables.

Based on its review, the staff finds the applicant's response to RAI Q3 acceptable because the applicant has adequately explained how the corrective actions are consistent with those in GALL AMP XI.E3. Therefore, the staff's concern described in RAI Q3 is resolved.

Based on the review of the information contained in the LRA and the applicant's responses to RAIs B.2.43-1, B.2.43-3, B.2.43-4, and Q3, the staff finds the Non-EQ Inaccessible Medium-Voltage Cables Program consistent with the program elements of GALL AMP XI.E3, and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE and noted that inaccessible medium-voltage cables in certain manholes at SSES have experienced significant moisture (i.e., cable in standing water for more than few days). In addition, during a walk down, the staff found several feet of water in Manhole Numbers 2 and 16.

The staff identified water in manholes as a generic, current operating plant issue in IN 2002-12, "Submerged Safety-Related Electrical Cables," dated March 21, 2002, and GL 2007-01, "Inaccessible or Underground Power Cable Failures That Disable Accident Mitigation Systems Or Cause Plant Transients," dated February 7, 2007. The staff will address water in manholes, during the current period of operation, through the reactor oversight process, in accordance with the requirements of 10 CFR Part 50.

During its review of the LRA, the staff determined that the Non-EQ Inaccessible Medium-Voltage Cable Program, if implemented as described, would ensure that the aging affects on inaccessible medium-voltage cables, due to exposure to significant moisture and significant voltage, will be adequately managed during the period of extended operation, and pursuant to the guidance contained in GALL AMP XI.E3. The Non-EQ Inaccessible Medium-Voltage Cable Program is a new AMP which will require the applicant to test the cables and to evaluate plant-specific OE to determine whether the inspection frequency of the manholes should be increased to ensure that the cables will be maintained in a dry environment, during the period of extended period of operation.

In the LRA, the applicant stated that the Non-EQ Inaccessible Medium-Voltage Cable Program is a new program for which there is no plant-specific OE.

In RAI Q1, dated July 3, 2008, the staff requested that the applicant describe plant-specific OE associated with cables and connections in this AMP and explain how the new program will manage non-EQ medium voltage cables.

In the response to RAI Q1, dated August 5, 2008, the applicant stated that the Non-EQ Inaccessible Medium-Voltage Cable Program is license renewal AMP and has not yet been implemented. However, the following example of OE demonstrates that the aging effects of interest in this AMP (i.e., degradation of the conductor insulation for medium-voltage cables exposed to significant moisture and voltage) can be, and has been, successfully detected at SSES. The applicant further stated that it detected a negative trend in power factor test results of 15 kV underground cables supplying power to the plant's river water intake. The test results are indicative of expected aging of the cable insulation system. The applicant also stated that these cables continue to be monitored under the plant corrective action program.

Based on its review, the staff finds the applicant's response to RAI Q1 acceptable because the applicant has adequately explained how the aging effects due to significant moisture and voltage will be detected and the corrective actions it will take. The staff determines that the applicant's response supports the conclusion that this AMP will provide assurance that the aging effects will be managed consistent with CLB, during the period of extended operation. Therefore, the staff's concern described in RAI Q1 is resolved.

On this basis, the staff determines that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Non-EQ Inaccessible Medium-Voltage Cables Program in LRA Section A.1.2.36, Commitment No. 38. The staff notes that SRP-LR Table 3.6-2 identifies when an inspection will be implemented and how often the inspection will be performed. The UFSAR supplement for the Non-EQ Inaccessible Medium-Voltage Cables Program does not provide the frequency of inspection.

In RAI Q2, dated July 3, 2008, the staff requested that the applicant provide the frequency of inspection in the UFSAR supplement.

In the response to RAI Q2, dated August 5, 2008, the applicant provided the inspection frequency for its UFSAR supplement.

Based on the review, the staff finds the applicant's response to RAI Q2 acceptable because the applicant has provided the frequency of inspection in the UFSAR supplement.

The staff finds that UFSAR Supplement summary description in LRA Section A.1.2.36 provides an adequate summary description of the applicant's Non-EQ Inaccessible Medium-Voltage Cables Program, as required by 10 CFR 54.21(d). The staff notes that the applicant has committed (Commitment No. 38) to implement this AMP prior to the period of extended operation.

Conclusion. On the basis of the review of the applicant's Non-EQ Inaccessible Medium-Voltage Cables Program and the applicant's responses to RAI B.2.43-1, B.2.43-3, B.2.43-4, Q1, Q2, and Q3, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(d). 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) and; therefore, is acceptable.

3.0.3.1.26 Metal-Enclosed Bus Inspection Program

Summary of Technical Information in the Application. In LRA Section B.2.44, the applicant described the new Metal-Enclosed Bus Inspection Program as consistent with the GALL AMP XI.E4, “Metal-Enclosed Bus.” The applicant also stated that this AMP will provide the periodic inspection of the applicable metal-enclosed bus, in order to determine whether age-related degradation is occurring. The applicant further stated that the program provides for the periodic inspection of the applicable metal-enclosed bus, in order to determine if age-related degradation is occurring.

Staff Evaluation. During the audit, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff reviewed and compared the “scope of program,” “preventative actions,” “parameters monitored/detected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “operating experience” program elements of the AMP to the corresponding program element criteria in the GALL AMP XI.E4.

The staff compared the programs elements in the applicant’s program to those in the GALL AMP XI.E4. The staff noted the program elements in the applicant’s AMP claim of consistency with GALL were consistent with the GALL AMP XI.E4. The staff determined that additional information was required to complete its review.

In addition to the requirements of 10 CFR Part 50, Appendix B, the “corrective actions” program element in the electrical GALL AMP XI.E4 recommends certain actions, such as making a determination of whether the same condition or situation is applicable to other accessible or inaccessible metal-enclosed busses. In the LRA, the applicant stated that its AMP is consistent with the GALL Report and referred to a corrective action element in the LRA, Section B.1.3, common to all AMPs. The staff determined that the corrective actions described in LRA Section B.1.3 do not contain certain recommendations described in the GALL AMP XI.E4.

In RAI Q3, dated July 3, 2008, the staff requested that the applicant explain, in detail, how the generic corrective actions in LRA Section B.1.3 are consistent with GALL AMP XI.E4.

In its response to RAI Q3, dated August 5, 2008, the applicant stated that for the new Metal-Enclosed Bus Inspection Program, further investigation and evaluation are performed when the acceptance criteria are not met. Corrective actions may include, but are not limited to cleaning, drying, an increased inspection frequency, replacement, or repair of the affected metal-enclosed bus components. If an unacceptable condition or situation is identified, the applicant further stated that it determines whether the same condition or situation is applicable to other metal-enclosed busses.

Based on the review, the staff finds the applicant’s response to RAI Q3 acceptable because the applicant has adequately explained how its generic corrective actions in the new Metal-Enclosed Bus Inspection Program are consistent with the GALL AMP XI.E4. The staff determines that the applicant’s corrective actions are consistent with those in the GALL AMP XI.E4. Therefore, the staff’s concern described in RAI Q3 is resolved.

Based on the review, the staff finds the Metal-Enclosed Bus Inspection Program consistent with the program elements of GALL AMP XI.E4 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant’s OE described in LRA Section B.2.44. The staff also reviewed industry experience relevant to this AMP and noted that industry experience has shown that failures have occurred on metal-enclosed busses caused by cracked insulation and moisture or debris buildup internal to the metal enclosed busses. Experience also has shown that bus connections in metal-enclosed busses exposed to appreciable ohmic heating, during operation, may experience loosening due to repeated cycling of connected loads. However, under the “operating experience” program element in the LRA, the applicant states that the Metal-Enclosed Bus Inspection Program is a new program for which there is no plant-specific OE.

In RAI Q1, dated July 3, 2008, the staff requested that the applicant describe plant-specific OE associated with cables and connections in this AMP and explain how the new program will manage the aging effects of metal-enclosed buses.

In the response to RAI Q1, dated August 5, 2008, the applicant stated that visual inspections were performed of bus 0A206 in 2006 and 0A107 in 1996. No significant age-related degradation was detected during these inspections. The applicant also stated that bus enclosures were found to be clean, with no evidence of overheating of bus connections. The applicant concluded that these activities demonstrate that the bus is generally accessible for visual inspection and in good condition, such that if any aging effects of interest for this AMP occur, they should be detected during future inspections.

Based on the review, the staff finds the applicant’s response to RAI Q1 acceptable because the applicant has adequately explained how the Metal-Enclosed Bus Inspection Program will manage the aging effects of metal-enclosed buses. The staff determines that the aging effects of metal-enclosed busses will be detected and this AMP will provide assurance that the aging effects will be managed consistent with CLB, during the period of extended operation. Therefore, the staff’s concern described in RAI Q1 is resolved.

On this basis, the staff confirms that the “operating experience” program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

<u>UFSAR Supplement</u>. The applicant provided the UFSAR supplement summary for the Metal-Enclosed Bus Inspection Program in LRA Section A.1.2.32, Commitment No. 39. The staff notes that SRP-LR Table 3.6-2 identifies when an inspection will be implemented and how often the inspection will be performed. The staff determined that the UFSAR supplement for the Metal-Enclosed Bus Inspection Program does not provide the frequency of inspection.

In RAI Q2, dated July 3, 2008, the staff requested that the applicant provide the frequency of inspection in the UFSAR supplement.

In the response to RAI Q2, dated August 5, 2008, the applicant provided the inspection frequency for the UFSAR supplement.

Based on the review, the staff finds the applicant’s response to RAI Q2 acceptable because the applicant has provided the inspection frequency for the UFSAR supplement. Therefore, the staff’s concern described in RAI Q2 is resolved.

The staff finds that UFSAR supplement in LRA Section A.1.2.32 provides an adequate summary description of the applicant’s Metal-Enclosed Bus Inspection Program, as required by 10 CFR 54.21(d). The staff notes that the applicant has committed (Commitment No. 39) to implement this AMP, prior to the period of extended operation.

Conclusion. On the basis of the review of the applicant's Metal-Enclosed Bus Inspection Program and the applicant's responses to RAIs Q1, Q2, and Q3, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.27 Non-EQ Electrical Cable Connections Program

Summary of Technical Information in the Application. In LRA Section B.2.45, the applicant described the new Non-EQ Electrical Cable Connections Program as consistent with the GALL AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The applicant stated that this AMP will manage the aging effects for the metallic parts of non-EQ electrical cable connections within the scope of license renewal. It will address cable connections that are used to connect cable conductors to other cables or electrical devices.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed and compared the "scope of program," "preventative actions," "parameters monitored/detected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "operating experience" program elements of the AMP to the corresponding program element criteria in GALL AMP XI.E6.

The staff compared the programs elements in the applicant's program to those in GALL AMP XI.E6. The staff noted that the program elements in the applicant's AMP claim of consistency with the GALL Report were consistent with the GALL AMP XI.E6. The staff determined that additional information was required to complete its review.

In addition to the requirements of 10 CFR Part 50, Appendix B, the "corrective actions" program element in the electrical GALL AMPs recommends certain actions, such as making a determination of whether the same condition or situation is applicable to other accessible or inaccessible cables and connections. In the LRA, the applicant stated that the AMPs are consistent with the GALL Report and referred to a corrective action element in LRA Section B.1.3, common to all AMPs. The staff determined that the corrective actions described in LRA Section B.1.3 do not contain certain recommendations described in the GALL AMP XI.E6.

In RAI Q3, dated July 3, 2008, the staff requested that the applicant explain, in detail, how the generic corrective actions in LRA Section B.1.3 are consistent with the GALL AMP XI.E6.

In the response to RAI Q3, dated August 5, 2008, the applicant stated that for the GALL AMP XI.E6, (the Non-EQ Electrical Cable Connections Program), it performs an engineering evaluation, when the test acceptance criteria are not met, to ensure that the intended functions of the cable connections can be maintained, consistent with the CLB. The evaluation will consider the significance of the test results, the operability of the component, the reportability of the event, the extent of the concern, the potential root causes, the corrective actions required, and the likelihood of recurrence. The applicant further stated that when an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to other in-scope cable connections that were not tested.

Based on its review, the staff finds the applicant's response to RAI Q3 acceptable because the applicant has adequately explained how the generic corrective actions in LRA Section B.1.3 are consistent with the GALL AMP XI.E6. The staff confirms that the corrective actions identified by the applicant are consistent with those recommended in the GALL report AMP XI.E6. Therefore, the staff's concern described in RAI Q3 is resolved.

Based on the review, the staff finds the Non-EQ Electrical Cable Connections Program consistent with the program elements of the GALL AMP XI.E6 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.45. The staff also reviewed industry guidance with relevance to this AMP. The staff noted that under the OE program element in the LRA, the applicant stated that the Non-EQ Electrical Cable Connections Program is a new program for which there is no plant-specific OE.

In RAI Q1, dated July 3, 2008, the staff requested that the applicant describe plant-specific OE associated with cables and connections in this AMP and explain how the new program will manage the aging effects of cable and connection insulations.

In the response to RAI Q1, dated August 05, 2008, the applicant stated that this license renewal AMP has not yet implemented, but, the following are examples of OE that demonstrate that the aging effects of interest in this AMP (i.e., loosening of cable connections), can be, and have been successfully detected. The applicant further stated that during routine maintenance activities in 2007, it found a cable crimp connection in a switchgear cubicle, operating at a higher temperature than other connections in the same circuit. The applicant determined that the temperature differential was only minor and; thus, not an operability concern. Nonetheless, the applicant replaced the cable lug. The applicant concluded that this demonstrates that a loose connection can be detected via thermography, before loss of intended functions. The applicant further stated that in 1997, using thermography while performing preventive maintenance activities on a battery charger, it detected a hot spot on the DC output cable lugs. The applicant replaced the cable lugs and returned the battery charger to service, without loss of intended function.

Based on the review, the staff finds the applicant's response to RAI Q1 acceptable because the applicant has demonstrated that the aging effects of cable connections will be detected using thermography. The staff determines that this AMP will provide assurance that the aging effects will be managed consistent with the CLB. Therefore, the staff's concern described in RAI Q1 is resolved.

On this basis, including the applicant's response to the RAI, the staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Non-EQ Electrical Cable Connections Program in LRA Section A.1.2.37, Commitment No. 50. The staff notes that SRP-LR Table 3.6-2 identifies when an inspection will be implemented and how often the inspection will be performed. The UFSAR supplement for the Non-EQ Electrical Cable & Connections Visual Inspection Program does not provide the frequency of inspection.

In RAI Q2, dated July 3, 2008, the staff requested that the applicant provide the frequency of inspection in the UFSAR supplement.

In the response to RAI Q2, dated August 5, 2008, the applicant provided the inspection frequency for its UFSAR supplement, Commitment No. 50.

Based on the review, the staff finds the applicant's response to RAI Q2 acceptable because the applicant has provided the frequency of inspection for the UFSAR summary. Therefore, the staff's concern described in RAI Q2 is resolved.

The staff finds that UFSAR Supplement summary description in LRA Section A.1.2.37, provides an adequate summary description of the applicant's Non-EQ Electrical Cable Connections Program, as required by 10 CFR 54.21(d). The staff notes that the applicant has committed to implement this AMP prior to the period of extended operation.

Conclusion. On the basis of the review of the applicant's Non-EQ Electrical Cable Connections Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB, for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.1.28 Environmental Qualification (EQ) Program

Summary of Technical Information in the Application. In LRA Section B.3.2, the applicant described the existing Environmental Qualification (EQ) Program as consistent with the GALL AMP X.E1, "Environmental Qualification (EQ) of Electric components" The applicant stated that this EQ program manages component thermal, radiation, and cyclic aging through the use of aging evaluation in accordance with 10 CFR 50.49(f) qualification methods.

As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced or have their qualification extended, prior to reaching the aging limits established in the evaluation.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed and compared the "scope of program," "preventive actions," "parameters monitored/detected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "operating experience" program elements of the AMP to the corresponding program element criteria in the GALL AMP X.E1.

The staff's review of the "corrective actions," "administrative controls," and "confirmatory controls" program elements for the Environmental Qualification (EQ) Program was performed as part of the staff's review of the QA attributes of the AMPs and is discussed in SER Section 3.0.4.

In comparing the programs elements in the applicant's program to those in the GALL AMP X.E1, the staff noted the program elements in the applicant's AMP claim of consistency with the GALL Report, were consistent with GALL AMP X.E1.

Based on the review, the staff finds the Environmental Qualification (EQ) Program consistent with the program elements of the GALL AMP X.E1 and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.3.2. The staff also reviewed the applicant's plant basis documents and finds that the applicant discussed OE with existing program. The OE, including past corrective actions, which resulted in a program's enhancement. The applicant stated in CR 191057, that while performing investigation of equipment, it concluded that terminal voltages typically exceed the 120 VAC rating of solenoid-operated valves in the EQ program. The study concluded an establishment of the maximum end-device voltages for U1 Class 1E 120V panels, and on the average 10 and T20 bus voltage over the last year. A review of effected Environmental Qualification Assessment Report has determined that temperature rise due to self-heat, at voltages above 120 VAC, has not been factored into qualified life determinations. Corrective action was taken to address the issue. The staff determines that this information will provide objective evidence to support the conclusion that the effects of aging will be managed so that the intended functions will be maintained consistent with CLB, during the period of extended operation.

The staff confirms that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement The applicant provided the UFSAR supplement summary of the EQ of electrical equipment in LRA Section A.1.3.4, Commitment No. 44. The summary description is not consistent with SRP-LR Table 4.4.2, as it does not contain reanalysis attributes. Reanalysis should address the attributes of analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, corrective actions, if acceptance criteria are not met, and the period of time when the reanalysis will be completed.

In RAI B.3.2-1, dated July 3, 2008, the staff requested that the applicant revise the UFSAR supplement to include these reanalysis attributes.

In the response to RAI B.3.2-1, dated August 5, 2008, the applicant added the following in LRA Section A.1.3.4:

> 10 CFR 50.49 requires EQ components that are not qualified for the current license term to be refurbished, replaced, or have their qualifications extended prior to reaching the aging limits established in the aging evaluation. Reanalysis of aging evaluation to extend the qualifications of components is performed on a routine basis as part of the EQ Program. Important attributes for the reanalysis of aging evaluations include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, corrective actions (if acceptance criteria are not met), and the time remaining to the end of qualified life.

Based on the review, the staff finds the applicant's response to RAI 3.2-1 acceptable because the applicant has revised the UFSAR supplement to be consistent with SRP-LR Table 4.4.2. Therefore, the staff's concern described in RAI 3.2-1 is resolved.

The staff finds that the UFSAR supplement summary description in LRA Section A.1.3.4, provides an adequate summary description of the applicant's EQ Program, as required by 10 CFR 54.21(d). The staff notes that the applicant has committed (Commitment No. 44) to implement this AMP prior to the period of extended operation.

Conclusion. On the basis of the review of the applicant's Environmental Qualification (EQ) Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP, including the applicant's response to RAI B.3.2-1, and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54,21(d) and; therefore, is acceptable.

3.0.3.2 AMPs Consistent with the GALL Report with Exceptions or Enhancements

In LRA Appendix B, the applicant stated that the following AMPs are, or will be, consistent with the GALL Report, with exceptions or enhancements:

- Inservice Inspection (ISI) Program
- BWR CRD Return Line Nozzle Program
- BWR Penetrations Program
- BWR Vessel Internals Program
- Bolting Integrity Program
- Piping Corrosion Program
- Closed Cooling Water Chemistry Program
- Fire Protection Program
- Fire Water System Program
- Buried Piping and Surveillance Program
- Fuel Oil Chemistry Program
- Reactor Vessel Surveillance Program
- Buried Piping and Tanks Inspection Program
- System Walkdown Program
- Lubricating Oil Analysis Program
- Masonry Wall Program
- Structures Monitoring Program
- RG 1.127 Water-Control Structures Inspection
- Fatigue Monitoring Program

For AMPs that the applicant claimed are consistent with the GALL Report, with exception(s), enhancement(s), or both, 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 Inservice Inspection (ISI) Program

Summary of Technical Information in the Application In LRA Section B.2.1, the applicant described the Inservice Inspection (ISI) Program as an existing program that is consistent, with an exception, to the GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD." The applicant stated that the program is in accordance with the requirements of ASME Code Section XI, Division 1, Subsections IWA, IWB, IWC, IWD, IWE, IWF, IWL, 1998 Edition through the 2000 Addenda, Mandatory Appendices, Inspection Program B of IWA-2432, and approved ASME Code Cases.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. The staff also confirmed that the applicant's program contains all of the elements of the GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

The staff noted the applicant had indicated that the current scope of the program applies to the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda. The program description in the GALL AMP XI.M1 states that the GALL Report applies to inspection, repair, and replacement activities for ASME Code components covered in the ASME Code Section XI, 2001 Edition, inclusive of the 2003 Addenda. The staff noted that the applicant clarified that the use of the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda, is consistent with the program description statement in GALL AMP XI.M1 because the SOC on 10 CFR Part 54 clarifies that acceptable editions of the ASME Code Section XI are those acceptable endorsed editions of the ASME Code Section XI up through the most recently endorsed edition of the Code mentioned in 10 CFR 50.55a. The staff verified that the SOC on 10 CFR Part 54 does include this clarification, and that based on this clarification, use of the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda, is consistent with the Code edition mentioned in the program description of GALL AMP XI.M1. Based on this review, the staff finds the applicant's crediting of the ASME Code Section XI, 1998 Edition, inclusive of the 2000 Addenda (for aging management) is consistent with the criteria in GALL AMP XI.M1.

In comparing the elements in the applicant's program to those in the GALL AMP XI.M1, the staff noted the program elements in the applicant's AMP claim of consistency with the GALL Report were consistent with the GALL AMP XI.M1 with the exception of program elements aspects identified below. The staff determined that additional information was required to complete its review.

The staff noted that the applicant had not identified the parameters or aging effect that the program manages in either the "scope of program," "parameters monitored/inspected," or "detection of aging effects" program elements for the AMP.

In RAI B.2.1-1, dated June 12, 2008, the staff requested that the applicant identify the parameters or aging effects that are within the scope of and are managed by the Inservice Inspection (ISI) Program.

In the response to RAI B.2.1-1, dated July 14, 2008, the applicant stated that during the period of extended operation, the Insevice Inspection (ISI) Program is credited to manage the following aging effects/mechanisms for components within the reactor coolant system, including the RV and RV internals:

- Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, and irradiation-assisted stress corrosion cracking

- Loss of material due to general, pitting, and crevice corrosion

- Loss of fracture toughness due to thermal aging embrittlement of CASS components

The applicant also stated that loss of fracture toughness due to thermal aging embrittlement of CASS components is managed via the detection of cracking and the monitoring of crack growth.

The staff finds the applicant's response partially addressed the staff's inquiry raised in RAI B.2.1-1, because the applicant has identified the aging effects managed by the Inservice Inspection (ISI) Program. However, the staff noted that, in LRA Table 3.1.2-3, the applicant credits the Inservice Inspection (ISI) Program to manage loss of fracture toughness of CASS recirculation pump thermal barriers. The staff also noted that the thermal barriers in the pumps (which provide a Class 1 to Class 2 interface) may not actually be accessible for inspection. The staff further noted that UT volumetric techniques, to date, cannot distinguish between UT signals that come from the CASS microstructures, from those that result from crack and/or flaw indications in the CASS material. Given that thermal aging of CASS can lead to a lower fracture toughness and cracking, the staff issued a follow-up RAI.

In RAI B.2.1-1R, dated October 27, 2008, the staff requested that the applicant describe the aging management of the primary recirculation pump CASS thermal barrier cover, specifically addressing the aging management of cracking that could occur between the pump shaft cavity and the reactor building closed-cooling water (RBCCW) cooling water cavity; and identify what inspection techniques will be used to perform these inspections.

In the response to RAI B.2.1-1R, dated November 17, 2008, the applicant stated that the use of the Inservice Inspection (ISI) Program to manage the aging effect of thermal aging embrittlement is consistent with the GALL Report item IV.C1-3, for Class 1 pump casings. The applicant further stated that PPL identified the thermal barrier as a separate component of the pump, even though it is part of the pump cover. The applicant further stated that the pump cover has a series of passages, created by machining and drilling, to allow cooling water, from the RBCCW system, to be circulated through the portion of the casing that surrounds the pump shaft, and that the portion of the pump cover that contains these passages and performs the cooling function is called the thermal barrier. The applicant also stated that since the thermal barrier is the same cast component as the pump cover, the Inservice Inspection (ISI) Program is also credited for managing loss of fracture toughness for the RCPB of the thermal barrier, which includes the portion of the pump cover between the pump shaft cavity and the cooling water cavity of the RBCCW system.

The staff reviewed the applicant's response and noted that AMR item IV.C-3 in the GALL Report, Volume 2 states that programs corresponding to the GALL AMP XI.M1 are acceptable programs to credit for management of loss of fracture toughness in ASME Code Class 1 CASS pump casings. The staff noted that, like the pump casings, the CASS pump covers also provide a portion of the RCPB portions of the pumps. The Inservice Inspection (ISI) Program finds that since the thermal barrier is part of the pump cover, the use of this AMP to manage the aging effects of the pump cover is an acceptable equivalency for managing the aging effect of the thermal barrier, which is normally not accessible.

Based on the review, the staff finds the applicant's response to RAI B.2.1-1R acceptable because the applicant has adequately described the aging management of the primary recirculation pump CASS thermal barrier cover and has identified the inspection techniques it will use to perform these inspections. On the basis that the thermal barrier is part of the recirculation pump cover and that the GALL Report item IV.C-3 recommends that the Inservice Inspection (ISI) Program be credited to manage reduction of fracture toughness of CASS recirculation pump casings and covers, the staff also finds the applicant's basis for crediting the ISI program for aging management of reduction of fracture toughness to be acceptable for these components. Therefore, the staff's concerns described in RAI B.2.1-1R are resolved.

The staff noted that the license renewal basis document for the Inservice Inspection (ISI) Program indicates that the criteria, in particular staff-approved BWRVIP reports, may be used in lieu of applicable ASME Code Section XI ISI requirements for ASME Code Class 1, 2, or 3 components.

In RAI B.2.1-2, dated June 12, 2008, the staff requested that the applicant address the basis for crediting the BWRVIP report criteria in lieu of the ASME Code Section XI requirements that are implemented under the Inservice Inspection (ISI) Program and for requesting clarification whether or not proposals to use staff-approved BWRVIP guideline criteria in lieu of applicable ASME Code Section XI requirements will be submitted for staff approval.

In the response to RAI B.2.1-2, dated July 14, 2008, the applicant stated that all proposals to use staff-approved BWRVIP guideline criteria in lieu of applicable ASME Code Section XI requirements will be submitted for staff approval as part of the relief request submittals for each 10-year ISI Inspection Plan, in accordance with 10 CFR 50.55a.

Based on the review, the staff finds the applicant's response to RAI B.2.1-2 acceptable because the applicant has confirmed that it will submit all proposals to use BWRVIP guidance criteria in lieu of ASME Code Section XI requirements for staff approval as part of 10 CFR 50.55a(a)(3) relief requests for the 10-year ISI Plans. Therefore, the staff's concern described in RAI B.2.1-2 is resolved.

The staff noted that the "corrective actions" program element discussion in the basis document for the Inservice Inspection (ISI) Program indicates that the corrective actions for the program will be implemented through implementation of the applicant's 10 CFR Part 50, Appendix B, Quality Assurance Program.

In RAI B.2.1-3, dated June 12, 2008, the staff requested that the applicant clarify how implementation of the SSES 10 CFR Part 50, Appendix B, Quality Assurance Program will ensure that the corrective actions for ASME Code Class 1, 2, or 3 components will be implemented, in accordance with applicable corrective actions in ASME Code Section XI Article IWB-3000, or its sub-articles, paragraphs, or subparagraphs; in staff-approved ASME Code Cases endorsed for use in the latest staff-issued version of RG 1.147; or through the staff's relief request process defined in 10 CFR 50.55a.

In the response to RAI B.2.1-3, dated July 14, 2008, the applicant stated that the Inservice Inspection (ISI) Program and governing procedures specify compliance with ASME Code Section XI corrective actions for defects found in Class 1, 2, or 3 components and includes use of the acceptance standards in the applicable sections of IWB-3000. The applicant also stated that the approved 10-Year ISI plan describes the use of staff-approved ASME Code Cases endorsed for use in the latest staff-issued version of RG 1.147 and when alternative standards are necessary, staff approval is obtained through the NRC Relief Request process.

The applicant further stated that the QA program specifies audits of the Inservice Inspection (ISI) Program every two years, following established auditing procedures, and that these audits are conducted in accordance with assessment basis documents that provide guidelines specific to the addressed topic. The applicant clarified that the SSES audit guideline for the Inservice Inspection (ISI) Program explicitly addresses compliance with 10 CFR 50.55a and related regulatory requirements and commitments.

The staff reviewed the response and noted that the Inservice Inspection (ISI) Program specifies compliance with ASME Code Section XI corrective actions, including acceptance standards in the applicable sections of IWB-3000. Furthermore, the staff noted that the applicant performs QA audits of its Inservice Inspection (ISI) Program every two years as required by the QA program, and verified that these QA audits are performed to ensure the corrective actions for the program are implemented in accordance with the corrective actions requirements in the ASME Code Section XI, staff-approved ASME Code Cases, or in accordance with acceptable alternative correction action programs requested and approved through the staff's 10 CFR 50.55a(a)(3) alternative ISI program process (i.e., through the staff's ISI program relief request process).

Based on this review, the staff finds the applicant's response to RAI B.2.1-3 acceptable because the applicant has implemented its QA program to ensure that the corrective actions are in compliance with either 10 CFR 50.55a and applicable ASME Code Section XI corrective action requirements, staff-approved ASME Code Cases, or acceptable alternative correction action programs that are approved through the staff's 10 CFR 50.55a(a)(3) alternative ISI program process, and because the applicant's program conforms to the recommendations in the "corrective actions" program element in the GALL AMP XI.M1. Therefore, the staff's concerns described in RAI B.2.1-3 are resolved.

Exception 1

The applicant has taken an exception to the "detection of aging effects" program element in the GALL AMP XI.M1. In this exception, the applicant proposed to use a risk-informed ISI methodology in lieu of the ASME Code Section XI tables for determining the inspection samples of particular ASME Code Class welds.

The staff noted that use of risk-informed ISI methodologies and programs must be requested and approved by the staff, in accordance with the staff's alternative program relief request provisions in 10 CFR 50.55a(a)(3). Consistent with this requirement, the staff makes the following statement in Chapter 1 of the GALL Report, Revision 1, Volume 2, for proposals to use alternative programs in lieu of complying with applicable ASME Code Section XI requirements:

> If an applicant seeks relief from specific requirements of 10 CFR 50.55a and Section XI of the ASME Code for the period of extended operation, the applicant will need to re-apply for relief through the 10 CFR 50.55a relief request process once the operating license for the facility has been renewed.

The staff verified that the risk-informed ISI program for Units 1 and 2 was approved in a staff-issued SE dated September 28, 2005. The staff also noted that the risk-informed ISI program relief request was only approved for the 3rd 10-Year ISI interval for Units 1 and 2 and that risk-informed ISI has yet to be proposed and approved for any of the 10-Year ISI intervals within the scope of the period of extended operation for Units 1 and 2.

In RAI B.2.1-5, dated June 12, 2008, the staff requested that the applicant commit to request relief for use of risk-informed ISI within 12 months before the start of each 10-Year ISI interval, if the applicant was planning on using a risk-informed ISI methodology for the 4th 10-Year ISI intervals or subsequent 10-Year ISI intervals for Units 1 and 2.

In the response to RAI B.2.1-5, dated July 14, 2008, the applicant revised the LRA to remove the statement that identifies the use of risk-informed ISI as an exception to the GALL

AMP XI.M1. The applicant stated that since the use of risk-informed ISI at SSES must be approved pursuant to 10 CFR 50.55a(a)(3), it is not considered to be an exception to the GALL Report.

Based on its review, the staff finds the applicant's response to RAI B.2.1-5 acceptable because the applicant has removed the use of risk-informed ISI as an exception to the GALL Report. The staff determines that the applicant need not make an LRA commitment to request relief for the use of risk-informed ISI in future intervals because the applicant is already committed to seek approval for the use of risk-informed ISI, in accordance with 10 CFR 50.55a(a)(3). Therefore, the staff's concern described in RAI B.2.1-5 is resolved.

Based on its review, the staff finds the applicant's ISI Program consistent with the program elements of the GALL AMP XI.M1 and; therefore, is acceptable.

<u>Operating Experience</u> The staff reviewed the applicant's OE basis document for safety significant OE relevant to the aging management of ASME Code Class 1, 2, and 3 components. The staff noted that the applicant only provided an overall OE summary statement in the "operating experience" program element for the Inservice Inspection Program and did not provide any examples of SSES specific and generic OE that would demonstrate that the AMP is accomplishing its intended objective.

During the onsite review of this AMP, the staff determined the license renewal basis binder for the Inservice Inspection Program included two CRs on circumferential flaw indications that were recorded for the safe end welds of the Unit 1 N4J recirculation outlet nozzle and N1B recirculation inlet nozzle, resulting from previous augmented UT examinations performed on these weld locations. The staff noted that the augmented inspections of these safe-end welds are credited in accordance with the BWR Stress Corrosion Cracking Program, and are implemented through augmented inspections performed under the Inservice Inspection Program. The staff determined that these CRs are significant because the applicable safe-end welds are ASME Code Class 1 RCPB locations, and because a complete circumferential weld failure of the nozzle safe-end components could result in a loss-of-coolant accident for the facility.

Thus, even though the staff verified that the applicant had listed the experience as relevant OE for the BWR Stress Corrosion Cracking Program and had taken appropriate corrective actions of the flaw indications by performing weld overlays of the components, the staff felt that the applicant should have mentioned these flaw indications as relevant OE for the Inservice Inspection Program, in the same manner that the CRs were listed as relevant OE for the BWR Stress Corrosion Cracking Program. The staff also noted that the applicant did not specify which staff-approved weld overlay methodology was applied to the repair of the flaw indications (i.e., cracks) in the recirculation inlet and outlet nozzles.

In RAI B.2.1-4, part a, dated June 12, 2008, the staff requested that the applicant amend the LRA to list these circumferential crack safe-end nozzle events as relevant OE for the "operating experience" program element in Inservice Inspection (ISI) Program. In RAI B.2.1-4, part b, the staff requested that the applicant identify the particular weld overlay methodology (along with its reference basis) used for the repairs of these safe-end nozzle indications, and clarify whether the overlay methodology required a flaw tolerance evaluation of the flaw indications and; if so, explain whether the analysis is a time-limited aging analysis (TLAA) for the application.

In the response to RAI B.2.1-4, part a, dated July 14, 2008, the applicant amended the LRA to add the relevant experience of the ultrasonic inspection of the NIB and N2J recirculation nozzle-safe end welds that revealed indications which were determined to be flaws. These welds are dissimilar metal welds and the indications were typical of SCC in Alloy 82/182 weld material.

The applicant stated that the flaws were repaired using full-structural weld overlays, based on the standard weld overlay defined in NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," and the weld overlay design was based on the requirements of ASME Code Section XI, IWB-3640 and Code Case N-504-2. The applicant further stated that the weld overlays were applied using Inconel 52, a material highly resistant to IGSCC, and that subsequent inspections performed in 2008 indicated no cracking in the weld overlays at the NIB and N2J nozzle-safe end weld locations.

In response to part b, the applicant stated:

> The flaws were repaired using full structural weld overlays that were designed to bound all cracking conditions in the nozzle-safe end (NOZ-SE) weld area, using the Standard Weld Overlay defined in NUREG-0313, Revision 2. The weld overlay design was based on the requirements of ASME Section XI, IWB-3640 and Code Case N-504-2. The weld overlay design conservatively assumed the flaws were through-wall and extended entirely around the pipe. No credit was taken for any remaining ligament in the original NOZ-SE welds. The weld overlays were applied using Inconel 52, a material highly resistant to IGSCC. The overlay welding methods result in compressive loads on the area beneath the overlay, thereby limiting the potential for further growth of the existing flaws. The overlay design also included a crack initiation and growth analysis, which demonstrated that the overlay will have a very low susceptibility for crack initiation and growth during the life of repair, due to the high IGSCC-resistance of the Inconel 52 alloy used in the overlay. Post-repair inspections assured the quality of the repair, and ongoing inspection requirements for the overlay and the underlying base material will identify any future degradation. The ASME Code required no flaw tolerance evaluations to be performed as part of the design basis for these repairs. There were no design basis analyses performed for the weld overlay repairs that constitute a TLAA.

The staff reviewed the applicant's response and noted that specific plant OE was identified. The applicant also provided the methodology used to perform the weld overlay repair. The staff concurs that use of Inconel 52 as weld material will provide a very low susceptibility for crack initiation and growth. Since no design basis analyses were performed and because ongoing inspections will be performed to manage aging, the staff finds that there are no TLAAs to be evaluated. However, Paragraph (g) of the Code Case mandates performance of an evaluation of the flaws that are left in place as part of the alternative repair weld overlay technology required by ASME Code.

In follow-up RAI B.2.1-4R, dated October 27, 2008 the staff requested that the applicant explain what it did to meet paragraph (g) of staff-approved ASME Code Case N-504-2, and whether a flaw growth assessment was performed in accordance with the Code Case, to clarify whether the flaw tolerance evaluation was effective for the remainder of the current licensed lives of Units 1 and 2.

In the response to RAI B.2.1-4R, dated November 17, 2008, the applicant stated:

> The weld overlay repairs for the SSES Unit 1 N1B and N2J recirculation

nozzle-to-safe-end welds were designed to the requirements of ASME Section XI, IWB-3640 and Code Case N-504-2. Additionally, the repairs were “full structural overlays,” or Standard Weld Overlays, as defined in Section 4.4 of NUREG-0313 Revision 2. As such, the overlay repairs were designed with the assumption that the underlying flaw was entirely through-wall and completely around the circumference of the component. No credit was taken for any remaining ligament in the repair location. The design of the overlays provides the necessary wall thickness to satisfy the flaw evaluation procedures of IWB-3640, in accordance with Code Case N-504-2 paragraph (f)(1), and ensures the structural adequacy of the component for all design loading conditions. This design approach is consistent with hundreds of similar overlay repairs on BWR recirculation nozzles and other IGSCC-susceptible components in the industry since 1985.

When the overlays were designed, there was conclusive evidence from past and present volumetric examinations that flaw growth had been arrested by the application of the Mechanical Stress Improvement Process (MSIP) in 1993 (for the N2J) and 1995 (for the N1B). The volumetric examination data was reviewed by PPL, General Electric, and EPRI NDE experts. The consensus conclusion was that the flaws had not grown since the application of MSIP. The lack of flaw growth between the time of MSIP application and 2004 confirmed that the residual compressive stress in the welds from MSIP, combined with the benefits of hydrogen water chemistry implementation in January 1999, had effectively eliminated further IGSCC. It was also recognized that weld overlay repairs would impose additional compressive stress in the welds. Therefore, it was concluded that there would be no, or negligible, flaw growth due to IGSCC into the future.

Since there was no flaw growth projected to exceed the assumed flaw in the overlay design, a flaw growth assessment and a flaw tolerance evaluation to demonstrate the structural adequacy for a predicted flaw size at the end of a specific operating interval (e.g., 40 years or 60 years) were not necessary. The full structural overlay, as designed with an assumed through-wall crack around the entire circumference in accordance with IWB-3640 and Code Case N-504-2, will remain structurally adequate for the operating life of the plant.

Code Case N-504-2 paragraph (g)(2) requires a weld repair evaluation to demonstrate that the requirements of IWB-3640 are satisfied for the design life of the repair, considering potential flaw growth. As discussed above, the potential flaw growth was determined to be zero, or negligible, such that the flaw assumed in the overlay design remains bounding for the life of the component. Therefore, the calculations performed to determine the required design size and thickness of the overlays serves as the evaluation required by Code Case N-504-2 paragraph (g)(2). Since those calculations are not dependent on any flaw growth assessments, they are not time-limited aging analyses (TLAA).

The staff reviewed the applicant’s response and Code Case N-504-2 paragraph (g)(2) and determined that the Code Case requires an assumed flaw size and a flaw growth analysis for the life of the plant. The staff noted that, for the applicant’s full structural overlay repairs, the applicant assumed that the underlying flaw was entirely through wall and around the circumference, and no credit was taken for any remaining ligament. The staff also noted that the applicant indicated that the structural overlays place the flaw in the original weld material in compression, such that the growth of the flaw is mitigated from growing into the weld overlay repair material.

Based on the review, the staff finds the applicant's response to RAI B.2.1-4R acceptable because the applicant has provided an acceptable basis for concluding that structural overlays are an acceptable alternative repair for ASME Code Class piping components and that the overlays need not be within the scope of a TLAA, because they are implemented pursuant to staff-approved ASME Code Case and because the overlays place the original flaw in compression, such that the flaws are mitigated from growing into the overlay weld repair material. Therefore, the staff's concern described in RAI B.2.1-4R is resolved.

The staff confirmed that the OE program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the Inservice Inspection (ISI) Program in LRA Section A1.2.23, Commitment No. 1. The reviewed this section and determines that the UFSAR supplement summary description for the Inservice Inspection (ISI) Program conforms to the staff's recommended UFSAR supplement SRP-LR Table 3.1-2. The staff finds that the applicant has committed (Commitment No. 1) to ongoing implementation of its Inservice Inspection (ISI) Program aging management of those in-scope components for which the AMP is credited and linked this commitment to UFSAR Supplement Summary Section A.1.2.23 for the Inservice Inspection (ISI) Program. Based on this review, the staff finds that UFSAR Supplement Summary Section A.1.2.23, when coupled to LRA Commitment No. 1, provides an acceptable UFSAR supplement summary description of the applicant's Inservice Inspection (ISI) 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 the audit and review of the applicant's Inservice Inspection (ISI) Program and the applicant's responses to the staff's RAIs, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.2.2 BWR CRD Return Line Nozzle Program

Summary of Technical Information in the Application. In LRA Section B,2.6, the applicant described the BWR Control Rod Drive (CRD) Return Line Nozzle Program as an existing program that is consistent with an exception with GALL AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle." The applicant stated that the BWR CRD Return Line Nozzle Program monitors the effects of cracking on the intended function of the CRD return line nozzle by performing ISIs in conformance with the ASME Code, Section XI, Subsection IWB, Table IWB 2500-1.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced the GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

Exception 1

The BWR CRD Return Line Nozzle Program takes an exception to the "acceptance criteria" program element to the GALL AMP XI.M6 to use a weld overlay methodology as an alternative corrective action repair technique for flaw indications that are detected in the CRD return line nozzles or their pressure boundary welds, including the CRD return line cap-to-nozzle welds. The staff noted the applicant indicated that the weld overlay repair methodology will be implemented in accordance with the requirements of 10 CFR 50.55a. The staff also noted that the applicant did not indicate that this exception was applicable to the "corrective actions" program element for the BWR CRD Return Line Nozzle Program. The ASME Code Section XI currently does not include any weld overlay methodologies as acceptable ASME Code Class repair techniques and nor does it include relief for use of non-Code weld overlay methods has not yet been granted for either of the 10-Year ISI intervals applicable to Units 1 and 2, for the period of extended operation.

In RAI B.2.6-1, dated July 23, 2008, the staff requested that the applicant commit to perform an ASME Code Section XI repair of the leaking component, unless the weld overlay repair methodology is submitted for staff review and approval and is granted in accordance with the requirements of 10 CFR 50.55a(a)(3). The staff requested that the applicant provide the basis for not applying the exception on the weld overlay methodology to the "corrective actions" program element in the GALL AMP XI.M6.

In its response to RAI B.2.6-1, dated August 22, 2008, the applicant amended the LRA to revise the exception to the “acceptance criteria” element of LRA Section B.2.6 and to add to Commitment No. 6 the following:

> PPL will implement weld overlay repairs in accordance with ASME Section XI and NRC-approved Code Cases. If no NRC-approved Code Case exists for the weld overlay, PPL will obtain NRC approval prior to implementing the repair in accordance with 10 CFR 50.55a.

The applicant also provided a basis for not including an exception to the "corrective actions" program element in the GALL AMP XI.M6, stating:

> Any identified cracks or indications in the CRD return line nozzle are evaluated under the rules of ASME Section XI. If the evaluation determines that a repair is required, the design and implementation of the repair is governed by the SSES ASME Section XI repair program, which requires the repair to meet Code requirements unless relief is granted by the NRC. Furthermore, in accordance with the SSES Inservice Inspection (ISI) Program, when cracks or indications are identified, a condition report is written and, at that point, the SSES corrective action program also controls the resolution of the condition. Both the SSES ASME Section XI repair program and the SSES corrective action program meet the requirements of 10 CFR 50, Appendix B.
>
> The corrective action element of GALL XI.M6 includes the statement that "As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions." Since the SSES ASME Section XI repair program and the SSES corrective action program both meet the requirements of 10 CFR 50, Appendix B, the corrective actions that would be taken in

accordance with those programs are consistent with GALL.

Based on the review, the staff finds the applicant's response to RAI B.2.6-1 acceptable because the applicant has included a commitment for the implementation of weld overlays. The staff notes that the applicant evaluates any identified cracks or indications in compliance with ASME Code Section XI. The staff determines that the applicant's evaluation and repair is performed in accordance with ASME Code Section XI and along with the applicant's Corrective Action Program, both meet the requirements of 10 CFR Part 50, Appendix B. Therefore, the staff's concern described in RAI B.2.6.1 is resolved.

Based on the review, the staff finds the applicant's BWR CRD Return Line Nozzle Program acceptable because it conforms to the recommended GALL AMP XI.M6, with an exception.

Operating Experience The staff reviewed the applicant's OE basis document for safety significant OE relevant to the aging management of CRD return line nozzle welds components. The staff noted in the OE discussion, the applicant indicated that, prior to initial startup of Units 1 and 2, the applicant cut and capped the CRD return line and the CRD return line nozzle to eliminate CRD return line flow from the plant design.

The staff finds this statement acceptable because it conforms to the criterion in the "preventative actions" program element of the GALL AMP XI.M6 which states that cutting and capping of CRD return lines, without rerouting the return line flow, is an acceptable mitigation technique for CRD return line nozzle programs.

The staff also noted that in the "operating experience" program element discussion for this AMP, the applicant stated that it has been implementing the required ASME Code Section XI inspections and the recommended augmented NUREG-0619, "BWR Feedwater Nozzle and Control Rod Driven Return Line Nozzle Cracking" inspections. The applicant further stated that to date, inspections of the capped CRD return line nozzles and the required surface examination and volumetric examinations did not indicate any evidence of flaw indications in the capped CRD return line nozzle inner blend radii or their associated ASME Code Class 1 welds. The staff verified that the applicant had implemented the recommended augmented UT and/or penetrate test (PT) inspections of the CRD return line cap-to-nozzle welds and nozzle inner blend radii that required inspection during the 11th and 12th RFOs for Unit 1 (*i.e*, U111RIO and U112RIO) and during the 9th RFO for Unit 2 (i.e., U209RIO). The staff verified that the applicant's UT and PT examinations of these CRD return line nozzle locations did not indicate the presence of any recordable flaw indications in the nozzle welds or inner blend radii.

Based on this review, the staff confirms that the applicant has been performing the augmented UT and PT inspections of CRD return line nozzle inner blend radii and cap-to-nozzle welds in accordance with its BWR CRD Return Line Nozzle Program. The staff further confirms that the applicant's program has been implemented in accordance with an augmentation of the Inservice Inspection (ISI) Program requirements of ASME Code Section XI, as modified by the recommended augmented inspection criteria in NUREG-0619. Based on this review, the staff finds that the RFO and IRs provide acceptable confirmation that the applicant is implementing the recommended augment inspections and that currently, there are no SSES-specific OE for the CRD return line nozzles or their associated pressure boundary welds, including the cap-to-nozzle welds.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for its BWR CRD Return Line Nozzle Program in LRA Section A.1.2.5, Commitment No. 6. The staff reviewed this section and confirms that the UFSAR supplement summary description for the BWR CRD Return Line Nozzle Program conforms to SRP-LR Table 3.1-2. The staff also confirms that the applicant has committed (Commitment No. 6) to ongoing implementation of the BWR CRD Return Line Nozzle Program for aging management of those SSES in-scope components for which the AMP is credited and linked this commitment to UFSAR Supplement Section A.1.2.23 for this AMP. In response to RAI B.2.6-1, dated August 22, 2008, the applicant revised Commitment No. 6 to state that if no staff-approved Code Case exists for the weld overlay; PPL will obtain staff approval, prior to implementing the repair pursuant to 10 CFR50.55a.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.5, when coupled with LRA Commitment No. 6, provides an acceptable UFSAR supplement summary description of the applicant's BWR CRD Return Line Nozzle Program because it is consistent with the UFSAR supplement summary description in the SRP-LR.

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 review of the applicant's BWR CRD Return Line Nozzle Program and the applicant's response to the staff's RAI, the staff finds all program elements consistent with the GALL Report. In addition, the staff reviewed the exception and its justification and determines that the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore is acceptable.

3.0.3.2.3 BWR Penetrations Program

Summary of Technical Information in the Application. In LRA Section B.2.8, the applicant described the existing BWR Penetrations Program as consistent, with an exception, with the GALL AMP XI.M8, "BWR Penetrations." The applicant stated that this program is used to manage the effects of aging that are applicable to the RV penetration nozzle components and their associated penetration welds. The applicant also stated that the exception is taken on the "scope of program" program element in the GALL AMP XI.M8 to include the RV flange leakoff penetration nozzle, vessel drain penetration nozzle, CRD penetration nozzles, and incore flux monitor penetration nozzles, as additional components that are within the scope of the AMP (i.e. in addition to the standby liquid control (SLC) nozzles and RV instrument penetration nozzles).

Staff Evaluation. During the audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception below to determine whether the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

Exception

The staff noted that the applicant's program takes an exception to the "scope of program" program element to the GALL AMP XI.M8. In this exception, the applicant identified that the BWR Penetrations Program is credited for managing the effects of aging for the vessel flange leakoff penetration, RV drain penetrations, CRD penetrations, and incore flux monitor penetrations, in addition to the SLR/core ΔP nozzle and the RV instrumentation nozzles.

The applicant's BWR Penetrations Program is based on the recommended augmented inspection and flaw evaluation guidelines found in BWRVIP Proprietary Topical Report Nos. TR-1007286 and TR-1007286, "BWR Vessel and Internals Project, BWR Standby Liquid Control System/Core Plate ΔP Inspection and Flaw Evaluation Guidelines (BWRVIP-27)" and "BWR Vessel and Internals Project, Instrument Penetration Inspection and Flaw Evaluation Guidelines (BWRVIP-49), " respectively. The staff approved BWRVIP-27 in a SE dated December 20, 1999. The staff approved BWRVIP-49 in a SE dated September 1, 1999 and noted that the scope of BWRVIP-27 is limited to SLC/core plate ΔP line nozzles and that the scope of BWRVIP-49 is limited to BWR instrument penetrations.

In RAI B.2.8-1, dated July 23, 2008, the staff requested that the applicant provide its basis for extending the scope of the GALL AMP XI.M8 to the RV flange leakoff line penetrations, RV drain penetrations, CRD penetrations, and incore flux monitor penetrations, and for concluding that the scope of either the BWRVIP-27 or BWRVIP-49 recommendations are applicable to the materials of fabrication, design aspects, and fabrication processes used in the fabrication of these additional penetrations.

In the response to RAI B.2.8-1, dated August 27, 2008, the applicant stated:

> The basis for extending the scope of GALL AMP XI.M8 to the RV drain penetrations, CRD penetrations, and incore flux monitor penetrations is that GALL Chapter IV, item IV.A 1-5 recommends crediting the BWR Penetrations Program and the BWR Water Chemistry Program to manage cracking for these components. In addition to the RV drain penetrations, CRD penetrations, and incore flux monitor penetrations, which are named in GALL item IV.A1-5, PPL extended this program to the RV flange leak off penetrations. While these penetrations are not named in GALL item IV.AI-5, the BWR Penetrations Program, as specifically defined for SSES in the program basis document, is an appropriate program to credit for managing cracking for these penetrations.
>
> The BWR Penetrations Program comparison to GALL, as stated in the program basis document, includes the details for aging management for all penetrations within the scope of the program. The program will inspect all in-scope penetrations in accordance with the requirements of ASME Section XI, augmented by the recommendations of approved BWRVIP reports. Inspections are scheduled in accordance with ASME Section XI, and examination results are evaluated in accordance ASME Section XI, IWB-3000. Acceptance of components for continued service is in accordance with ASME Section XI and, when applicable, BWRVIP guidance.
>
> The SSES BWR Penetrations Program manages the CRD and flux monitor penetrations in accordance with the NRC-approved guidance in BWRVIP-47-A and BWRVIP-74-A. The RV flange leak off penetrations and the RV drain penetrations are being managed by NRC-approved guidance in BWRVIP-74-A. Thus, all penetrations are being managed by BWRVIP guidance that the NRC has previously approved as adequate for the period

of extended operation.

The staff reviewed the GALL Report, item IV.A1-5 and notes that it does include CRD stub tubes, instrumentation, incore flux monitors and vessel drain line, and the recommended AMP to manage the aging effects is GALL AMP XI.M8. The staff also reviewed BWRVIP-47-A, and BWRVIP-74-A and concludes that these documents address CRD and flux monitor penetrations and are applicable.

Based on the review, the staff finds the applicant's response to RAI B.2.8-1 acceptable because the applicant has appropriately provided the basis for extending the scope of the GALL AMP XI.M8 to the RV flange leakoff line penetrations, RV drain penetrations, CRD penetrations, and incore flux monitor penetrations. Therefore, the staff's concern described in RAI B.2.8-1 is resolved.

Review of License Renewal Applicant Action Items

In the SEs on Topical Report BWRVIP-27, BWRVIP-47, BWRVIP-49, and BWRVIP-74 the staff issued the following three renewal applicant action items common to the staff's evaluations on the reports:

1. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within this BWRVIP report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).

The applicant provided both the staff's renewal applicant action item descriptions and its responses to these actions items in LRA Appendix C, Tables BWRVIP-27-A, BWRVIP-47-A, BWRVIP-49-A and BWRVIP-74-A. The applicant stated that the BWRVIP program administratively requires (a license imposed requirement) the applicant to implement the applicable BWRVIP inspection and flaw evaluation guidelines (including those in BWRVIP-27, BWRVIP-47, BWRVIP-49, and BWRVIP-74) at SSES and that procedures administratively mandate the applicant to write a justification for any deviations from the recommended criteria in the applicable BWRVIP inspection and flaw evaluation guidelines. The applicant also stated it has not yet identified any deviations from its implementation of the BWRVIP-27, BWRVIP-47, BWRVIP-49, and BWRVIP-74 inspection and flaw evaluation guidelines, and commits to further implementation of the staff-approved versions of the BWRVIP-27, BWRVIP-47, BWRVIP-49, and BWRVIP-74 guidelines, in order to ensure that the aging effects applicable to the SLC/core plate P nozzles, RV instrumentation nozzles and other RV nozzles within the scope of the program will be managed, for the period of extended operation.

The staff confirms that the applicant has provided a commitment (Commitment No. 8) for continued implementation of the recommended inspection and flaw evaluation guideline recommendations, and that the commitment has been placed on UFSAR Supplement Section A.1.2.7. The staff finds that the applicant has adequately addressed the staff's renewal applicant action item on BWRVIP-27, BWRVIP-47, BWRVIP-49, and BWRVIP-74 because it clarified that SSES would not deviate from the recommended inspection and flaw evaluation criteria, and because the applicant has committed to continued implementation of the guidelines in these reports.

Based on this review, the staff concludes that the applicant has adequately addressed the staff's first renewal applicant action item on BWRVIP-27, BWRVIP-47, BWRVIP-49, and BWRVIP-74. Therefore, this renewal applicant action item is resolved.

2. Those applicants for license renewal referencing the BWRVIP-27 report for the DP/SLC vessel penetration/nozzle and safe end extensions shall ensure that the programs and activities specified as necessary in the BWRVIP-27 document are summarily described in the UFSAR supplement. Those applicants for license renewal referencing the BWRVIP- 49 report for the instrument penetrations shall insure that the programs and activities specified as necessary in the BWRVIP-49 report are summarily described in the UFSAR supplement." "Those applicants for license renewal referencing the BWRVIP- 47 report for the lower plenum shall insure that the programs and activities specified as necessary in the BWRVIP-47 report are summarily described in the UFSAR supplement.

The applicant stated that LRA Section A includes the UFSAR supplement for the BWR Penetrations Program. The staff confirmed that the applicant provides the UFSAR supplement summary description for the BWR Penetrations Program in UFSAR Supplement Section A.1.2.7. The staff also confirmed that LRA Section A.1.2.7 includes BWRVIP-27 and BWRVIP-49. However, in response to RAI B.2.8-1, dated August 27, 2008, the applicant added BWRVIP-47 and BWRVIP-74, which are not included in the UFSAR summary description. In a follow-up RAI B.2.8-1R, dated October 17, 2008, the staff requested that the applicant address this issue.

In the response to RAI B.2.8-1R, dated November 11, 2008, the applicant revised the LRA to include BWRVIP-47-A and BWRVIP-74-A in the descriptions of the BWR Penetrations Program in LRA Sections A.1.2.7 and B.2.8. The applicant revised the last sentences of A.1.2.7 and program description of B.2.7 as follows:

> BWRVIP-27-A report addresses the standby liquid control system nozzle or housing, the BWRVIP-47-A report addresses the control rod drive and flux monitor penetrations in the lower plenum, the BWRVIP-49-A report provides guidelines for instrument penetrations, and the BWRVIP-74-A report addresses the reactor vessel flange leakoff penetrations and the reactor vessel drain penetrations.

The staff reviewed the applicant response and notes that the applicant has appropriately identified BWRVIP-47-A and BWRVIP-74-A in the program description and in the UFSAR supplement. Based on this review, the staff finds the applicant response acceptable and concludes that the applicant has adequately addressed the staff's second renewal applicant action item on BWRVIP-27, BWR-47 and BWRVIP-49. Therefore, this renewal applicant action item is resolved.

3. Those applicants for license renewal referencing BWRVIP-27 for the DP/SLC vessel penetration/nozzle and safe end extensions shall ensure that the inspection strategy described in the BWRVIP-27 report does not conflict or result in any changes to their technical specifications. Those applicants for license renewal referencing BWRVIP-49 for the instrument penetrations shall ensure that the inspection strategy described in the BWRVIP-49 document does not conflict or result in any changes to their technical specifications." "Those applicants for license

> renewal referencing BWRVIP-47 for the lower plenum shall ensure that the inspection strategy described in the BWRVIP-47 document does not conflict or result in any changes to their technical specifications.” If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.

The applicant stated that its implementation of the inspection strategies in BWRVIP-27, BWRVIP-47 and BWRVIP-49 will not result in the need for any changes of the TS for either Unit 1 or Unit 2. The staff reviewed the TS for Units 1 and 2 and confirmed that, while the methods in BWRVIP-27, BWRVIP-47, and BWRVIP-49 may constitute alternative staff-approved inspection guidelines for the ASME Code Class 1 RV penetration nozzle welds, the TSs for SSES do not include any requirements to implement the ASME Code Section XI ISI programs, neither do they include BWRVIP-27, BWRVIP-47 or BWRVIP-49 augmented inspection program criteria. The staff also confirmed that the applicant’s TSs are derived from operational-, surveillance-, and administrative control-based requirements and that, instead, the Inservice Inspection (ISI) Program requirements and BWRVIP-27, BWRVIP-47, and BWRVIP-49 augmented inspection process are implemented through the applicant’s ASME Code Section XI ISI program, in accordance with 10 CFR 50.55a. Thus, based on this review, the staff concludes that the applicant has provided an adequate basis for concluding that its implementation of the guidelines in BWRVIP-27, BWRVIP-47, and BWRVIP-49 will not conflict with or result in any necessary changes in the SSES TS. Based on this review, the staff concludes that the applicant has adequately addressed the staff’s third renewal applicant action item on BWRVIP-27, BWRVIP-47, and BWRVIP-49. Therefore, this renewal applicant action item is resolved.

In the SE for BWRVIP-27, the staff included an additional fourth renewal applicant action item. In this action item, the staff stated that BWR applicants referencing the BWRVIP-27 report should identify and evaluate the projected fatigue cumulative usage factors (CUFs) for their SLC/core plate ΔP nozzles as a potential TLAA for the application. The applicant stated that the only analysis on the SLC/core plate ΔP nozzles that meets the definition of a TLAA is the CUF analysis for the SLC/core plate ΔP nozzles and that the TLAA analysis for these nozzle components is provided in LRA Section 4.3.1. The staff confirmed that the applicant has included its metal fatigue CUF analysis for the N-10 SLC/core plate P nozzles in LRA Section 4.3.1 and that LRA Table 4.3-2 includes both the design basis CUFs and the 60-year projected CUFs for N-10 SLC/core plate P nozzles. Based on this review, the staff finds that the applicant has met this renewal applicant action item because, consistent with the action item, the applicant has identified the CUF analysis for these nozzles as a TLAA, and has provided this TLAA in LRA Section 4.3.1. The staff evaluates this TLAA in SER Section 4.3.1. Therefore, this renewal applicant action item is resolved.

Based on the review of the exception, and resolution of the related RAI, the staff finds the BWR Penetrations Program consistent with the program elements of GALL AMP XI.M8, with an exception and; therefore, is acceptable.

Operating Experience. The staff reviewed the applicant’s “operating experience” program element discussions in the BWR Penetrations Program and in the license renewal basis document for this AMP. The staff noted that the “operating experience” program element in the license renewal basis document indicated that the applicant had reviewed the last five Inservice Inspection Outage Summary Reports for Units 1 and 2 and that the ISIs or augmented ISIs performed on the penetration nozzles did not identify any relevant flaw indications. The staff confirmed that, although the applicant has not yet identified any relevant indications for the penetrations within the scope of this AMP, it has recorded flaw indications and initiated appropriate CR action requests on flaw indications identified in some of the RV internal components. These actions are part of the applicant's in-vessel visual inspections performed on its BWR RV internals, and which is another BWRVIP Report-based AMP.

The staff finds the applicant's "operating experience" program element acceptable because the applicant's augmented inspection process used to implement the BWRVIP-based augmented inspections of the RV penetration nozzles and RV internals components has actual detected and recordable RV internals indications that are within the scope of the BWR Vessel Internals Program. This demonstrates that the applicant's BWRVIP-based augmented inspection process for its RV penetration nozzles and RVI components is effective. The staff also finds the OE acceptable because the applicant has committed (Commitment No. 8) to continued implementation of the BWR Penetration Program and; implementation of the guidelines in BWRVIP-27 for SLC/core plate Δ penetration nozzles, the BWRVIP-47 for CRD and flux monitor penetrations in the lower plenum, the BWRVIP-49 for RV instrument penetration nozzles, and the BWRVIP-74 for RV flange leakoff penetrations and the RV drain penetrations.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided the UFSAR supplement summary for the BWR Penetrations Program in LRA Section A.1.2.7, Commitment No. 8. The staff reviewed this section and notes that in response to RAI B.2-1R, dated November 11, 2008, the applicant revised the UFSAR supplement to add BWRVIP-49 and BWRVIP-74. The staff confirms that that applicant has committed (Commitment No. 8) to continued implementation of the recommended inspection and flaw evaluation guideline recommendations. The staff finds that the applicant's UFSAR supplement summary description for the BWR Penetrations Program, with this revision, conforms to the staff's recommended UFSAR supplement in SRP-LR Table 3.1-2.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.7, when coupled with Commitment No. 8, provides an acceptable UFSAR supplement summary description of the applicant's BWR Penetrations Program because it is consistent with the UFSAR supplement summary description in the SRP-LR.

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 review of the applicant's BWR Penetrations Program and the applicant's response to the staff RAIs, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and its justification and determines that the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.2.4 BWR Vessel Internals Program

Summary of Technical Information in the Application. In LRA Section B.2.9, the applicant described the existing BWR Vessel Internals Program as consistent, with an enhancement, with the GALL AMP XI.M9, “BWR Vessel Internals.” The applicant stated that this program is used to manage cracking, loss of material, and reduction of fracture toughness for various subcomponents of the RV internals.

Staff Evaluation. During the audit and review, the staff confirmed the applicant’s claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, is adequate to manage the aging effects for which the LRA credits it. The staff noted that the program elements in the applicant’s AMP claim of consistency with the GALL Report were consistent with GALL AMP XI.M9, with the exception of the issue identified below that the staff determined required additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced the GALL Report. The staff conducted onsite interviews with the applicant to confirm these results.

The staff noted that the scope of the BWR Vessel Internals Program includes Topical Report BWRVIP-76, which has been approved by the staff and which provides the BWRVIP's recommended inspection and flaw evaluation guidelines for BWR core shrouds. BWRVIP-76, Appendix C (a) provides guidance to evaluate structural integrity of the core shroud welds exposed to neutron radiation during plant operation, (b) discusses the use of generic fracture mechanics analyses for establishing inspection intervals for core shroud welds containing cracks, and (c) provides the notch fracture toughness values for irradiated stainless steel materials. The data in this appendix suggest that the fracture toughness values for stainless steel materials tends to decrease with increasing exposure to neutron fluences greater than 1E21 n/cm^2 (E> 1 MeV). In August 2006, the BWRVIP issued staff-approved Topical Report No. BWRVIP-100-A, "Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds," which discussed and provided updated fracture toughness results for irradiated stainless steel materials. The BWRVIP 100-A report identified that the fracture toughness values for irradiated stainless steel material may actually be lower than those previously documented in the staff-approved version of BWRVIP-76.

In RAI B.2.9-3, dated July 23, 2008, the staff requested that the applicant clarify whether the results and recommendations in the staff-approved BWRVIP-100-A are within the scope of the BWR Vessel Internals Program BWRVIP and; if yes, clarify how the recommendations in BWRVIP-100-A will be used in conjunction with the recommendations in BWRVIP-76 for evaluations of cracking in core shrouds.

In the response to RAI B.2.9-3, dated August 27, 2008, the applicant stated that LRA Sections A.1.2.10 and B.2.9 state that the BWR Vessel Internals Program includes inspection and flaw evaluation that conforms to the guidelines of applicable and staff-approved BWRVIP reports. As such, BWRVIP-100-A is currently within the scope of the BWR Vessel Internals Program. Under this AMP, the appliant is committed to following the current, staff-approved BWRVIP guidance for managing cracking of the core shroud, during the period of extended operation.

The applicant also stated that the current, staff-approved BWRVIP guidance for evaluating flaws in the high-fluence core shroud welds is documented in BWRVIP-76, BWRVIP-99, and BWRVIP-100-A and requires the use of the updated fracture toughness results for irradiated stainless steel materials from BWRVIP-100-A. The applicant further stated that until

BWRVIP-76 Appendix C is revised as recommended in BWRVIP-100-A, only those shroud welds that have fluences less than 1E21 n/cm^2 will have their inspection intervals determined using BWRVIP- 76, Table 2-1. For shroud welds that have fluences greater than 1E21 n/cm^2, the inspection intervals will be determined on a case specific basis, in accordance with the guidance provided in BWRVIP-99 and BWRVIP-100-A.

Based on the review, the staff finds the applicant's response to RAI B.2.9-3 acceptable because the applicant has adequately clarified its use of the latest staff approved BWRVIP-100A for core shroud welds that have fluences greater than 1E21 n/cm^2 and BWRVIP-76 for core shroud welds that have fluences less than 1E21 n/cm^2. The staff determines that the applicant has satisfactorily described how it proposes to use BWRVIP-76 and BWRVIP-100 in conjunction with each other and has committed to follow the current staff-approved BWRVIP guidance to manage cracking of core shroud welds. Therefore, the staff's concern described in RAI B.2.9-3 is resolved.

In the review of the program basis document, the staff determined that the applicant is crediting the BWR Vessel Internals Program to manage the aging effects of reduction in fracture toughness for core shroud, core plate, top-guide components, orificed and peripheral fuel support pieces, CRD tubes, jet pump assemblies and their subcomponents, and incore dry tubes from the source range and intermediate range monitors. The staff has confirmed that the program credits the augmented inspection and flaw evaluation criteria in staff-approved BWRVIP topical reports as the basis for managing the aging effects applicable to SSES RV and RV internal components. Loss (reduction) of fracture toughness is not an aging effect "per se," but, instead, refers to a change that may occur in the fracture toughness material property over time.

In RAI B.2.9-4, dated July 23, 2008, the staff requested that the applicant explain how the recommended BWRVIP report guidelines within the scope of the BWR Vessel Internals Program BWRVIP, will accomplish adequate management of reduction of fracture toughness in these RV internal components. The staff also requested that the applicant justify why the applicable BWRVIP inspection and flaw evaluation guidelines for these RV internal components are considered to be capable of managing reduction of fracture toughness in the components, and clarify the methodology or methodologies in these reports credited for management of this aging effect.

In the response to RAI B.2.9-4, dated August 27, 2008, the applicant stated that the orificed fuel support pieces are CASS, and reduction of fracture toughness is managed by the Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program, and not by the BWR Vessel Internals Program, as shown in LRA Table 3.1.2-2.

The applicant further stated:

> The remaining reactor vessel (RV) internals components are the core shroud, core plate, top guide, fuel support pieces (peripheral), control rod guide tubes, jet pump assemblies, and incore dry tubes. These components are all addressed in specific BWRVIP reports. The applicable BWRVIP inspection and flaw evaluation guidelines for these RV internal components are considered to be capable of managing ROFT because the inspections are designed to detect cracking, and, if cracking is detected, the inspection intervals will be adjusted based on crack growth rates that are determined by evaluations that include the effects of ROFT. The examination methods in the BWRVIP reports include ultrasonic examination and visual examination of the RV internal components, when accessible, for

the detection of cracks. These same methods are credited for managing ROFT, since ROFT is managed as cracking is identified, evaluated, and monitored in components with fluence values exceeding the threshold for ROFT.

Based on the review, the staff finds the applicant's response to RAI B.2.9-4 acceptable because the applicant has adequately explained that the BWRVIP guidelines provide examination methods and evaluation techniques to detect cracking, and inspection intervals are adjusted based on the results of the inspection. The staff finds that the guidelines will also manage reduction of fracture toughness, since fluence is one of the key factors affecting the crack growth rate, which increases as fluence increases the yield strength of the material (i.e., reduces fracture toughness). Therefore, the staff's concern described in RAI B.2.9-4 is resolved.

The staff noted that BWRVIP-76, Appendix C provides guidance to evaluate structural integrity of the core shroud welds which is affected by the exposure to neutron radiation during the service. In this appendix, the BWRVIP discusses the use of generic fracture mechanics analyses for establishing inspection intervals for the core shroud welds with cracks, and previous data suggests that the fracture toughness values tend to decrease when stainless steel materials are exposed to neutron fluence. BWRVIP-76, Appendix C provides notch toughness values which can be used for irradiated stainless steel materials.

In RAI B.2.9-5, dated July 23, 2008, the staff requested that the applicant clarify whether the results and recommendations in the staff-approved BWRVIP-100-A are within the scope of the BWR Vessel Internals Program and; if yes, clarify how the recommendations in BWRVIP-100-A will be used in conjunction with the recommendations in BWRVIP-76 for evaluations of cracking in core shrouds.

In the response to RAI B.2.9-5, dated August 27, 2008, the applicant stated that its response to RAI B.2.9-3, above, addresses RAI B.2.9-5. The staff acknowledges that RAI B.2.9-3 requested the same information as RAI B.2.9-5 and finds that the applicant's response to RAI B.2.9-3 also is acceptable for RAI B.2.9-5. Therefore, the staff's concern described in RAI B.2.9-5 is resolved.

Enhancement 1

The staff noted that the applicant's program indicated that the "scope of program" program element for the BWR Vessel Internals Program will be enhanced to require augmented inspection of the SSES top guide grid beams and beam-to-beam crevice slots. The augmented inspections of these components will include completion of five percent of the total population of grid beams and beam-to-beam crevice slots within six years of entering the period of extended operation, with completion of an additional five percent within 12 years of entering the period of extended operation. The applicant stated that the scope of inspections will focus on those grid beams and beam-to-beam crevice slots with neutron fluences projected to be greater than 5.0×10^{20} n/cm^2 (E > 1.0 MeV) at 60 years.

The staff noted that GALL AMP XI.M9 indicates that the industry's augmented inspection and flaw evaluation guidelines for BWR top guides and their subcomponents are provided in Topical Report No. BWRVIP-26. The staff issued its SE on BWRVIP-26 in a letter to the BWRVIP dated December 7, 2000. In this letter, the staff endorsed the BWRVIP's recommended augmented inspection for BWR top guides and their subcomponents. However, these augmented inspection guidelines did not provide any recommendations for BWR top guide grid beam locations and beam-to-beam crevice slots. In the staff's updated GALL Report guidance, as described in the

GALL AMP XI.M9, the staff took the position that augmented inspections should be performed on the top guide grid beam and beam-to-beam crevice slots to address the potential for irradiation-assisted stress corrosion cracking (IASCC) to occur in these top guide locations. Specifically, the staff makes the following recommendation in GALL AMP XI.M9:

> Alternatively, if the neutron fluence for the limiting top guide location is projected to exceed the threshold for IASCC after entering the period of extended operation, inspect 5% of the top guide locations (EVT-1) within six years after the date projected for exceeding the threshold. An additional 5% of the top guide locations will be inspected within twelve years after the date projected for exceeding the threshold.

The staff's recommendation in the GALL AMP XI.M9 is predicated on the fact that an applicant for license renewal of its BWR facility has not yet detected any signs of cracking in the top guide grid beams and beam-to-beam crevice locations. The staff noted that the applicant's proposed enhancement calling for augmented inspections of the SSES top guide grid beam and beam-to beam locations conforms to the recommendations in GALL AMP XI.M9, as long as there has not been any evidence of cracking in these top guide locations.

In RAI B.2.9-1, dated June 12, 2008, the staff requested that the applicant clarify whether it had performed any augmented inspections of the top guide grid beam and beam-to-beam crevice slot locations to date and; if so, summarize the inspection results of the augmented examinations performed on these top guide components.

In its response to RAI B.2.9-1, dated July 14, 2008, the applicant stated:

> The Unit 1 top guide beam and beam-to-beam crevice slot locations were inspected in 2004 during the thirteenth refueling outage. Twelve fuel cell locations were examined using the VT-3 inspection method. The Unit 1 top guide was inspected again in 2008. At that time, the top guide beam and beam-to-beam crevice slots at one cell location were inspected using the EVT- 1 inspection method. No recordable indications were found in either Unit 1 inspection.
>
> The Unit 2 top guide beam and beam-to-beam crevice slot locations at twenty-one fuel cell locations were inspected in the Unit 2 eleventh refueling outage in 2003 using the VT-3 inspection method. In 2007, four additional fuel cell locations in the Unit 2 vessel were inspected using the VT-3 inspection method. No recordable indications were found in either Unit 2 inspection.

Based on the review, the staff finds the applicant's response to RAI B.2.9-1 acceptable because the applicant has clarified that it has performed augmented inspections of the top guide grid beam and beam-to-beam crevice slot locations and no recordable indications were found. Therefore, the staff's concern described in RAI B.2.9-1 is resolved.

On the basis that the applicant has performed inspections of the top guide locations using appropriate inspection techniques, and no recordable indications were found, the staff finds the enhancement acceptable, because the implementation of the enhancement will make the applicant's program consistent with GALL AMP XI.M9. The staff verified that the applicant has incorporated its enhancement of the BWR Vessel Internals Program in Commitment No. 9 in LRA Table A-1 and was placed on UFSAR Supplement Section A.1.2.10.

However, in response to RAI 4.3-4, dated November 25, 2008, the applicant stated that since the submittal of the LRA, the BWR Vessel Internals Program has been revised to include requirements to inspect the top guide. The applicant further stated that the BWR Vessel Internals Program now requires that at least 10 percent of the grid beam cells containing control rod drives and/or blades will be inspected every twelve years, with at least five percent of the inspections performed within the first six years of each twelve year interval. The applicant also stated that the top guide locations to be inspected are those subject to neutron fluence levels that exceed the IASCC threshold of 5.0E+20 n/cm^2, and that the inspections will be performed using the enhanced visual inspection technique, EVT-1.

Furthermore, in response to RAI 4.3-4, the applicant stated that PPL will continue to perform inspections on at least 10 percent of the top guide locations, every twelve years, during the period of extended operation. The applicant accordingly revised the LRA to delete the enhancement from LRA Section B.2.9, UFSAR Supplement Section A.1.2.10, and LRA Table A-1
(Commitment No. 9).

In a teleconference held on December 18, 2008, the staff discussed with the applicant, the degree of detail needed for implementing augmented inspections of top guide grid-to-beam and beam-to-beam locations. In this teleconference, the staff established that the applicant would need to commit to augmented inspections of the top guide locations or amend its response to RAI 4.3-4. Any amended response to RAI 4.3-4 should discuss the corrective actions and sample expansion criteria that the applicant would implement, if augmented inspections of the top guide grid-to-beam and beam-to-beam locations detected cracking in the components.

In a letter dated December 29, 2008, the applicant submitted a supplemental response amending the LRA to include a commitment for augmented inspections of the top guide grid-to-beam and beam-to-beam locations, in UUFSAR Supplement A.1.2.10. Specifically, the applicant committed to the following activities for the top guide grid-to-beam and beam-to-beam locations:

> PPL will continue to perform inspections on at least 10% of the top guide grid beam cells containing control rod drives/blades every twelve years during the period of extended operation, with at least 5% of the inspections being performed within the first six years of each twelve year interval. The top guide locations to be inspected are those subject to neutron fluence levels that exceed the IASCC threshold of 5.0E+20 n/cm^2. The inspections will be performed using the enhanced visual inspection technique, EVT-1.

The staff finds that the applicant's amendment for augmented inspection of the top guide grid-to-beam and beam-to-beam locations acceptable because the applicant's commitment #9 for augmented inspection of these top guide locations is consistent with the staff's recommended augmented inspection criteria for the locations in the "detection of aging effects" program element in GALL AMP XI.M9.

Review of License Renewal Applicant Action Items

LRA Appendix C provides the applicant's responses to the staff's renewal applicant action items on the BWRVIP-based reports within the scope of the BWR Vessel Internals Program. The applicant's program also includes an enhancement to perform augmented inspections of the

SSES top guide gird beam and beam-to-beam crevice slots. The staff evaluates the applicant's responses to the staff's renewal applicant action items later in this section.

The staff's renewal applicant action items for the BWRVIP Topical Reports within the scope of a BWR Vessel Internals Program are provided in specific staff SEs issued to the BWRVIP with respect to their inspection and flaw evaluation guidelines.

The following table summarizes the topical reports within the scope of the applicant's BWR Vessel Internals Program and the staff's SEs issued on these topical reports.

Component	BWRVIP Topical Report Reference	NRC SER Date	SER Accession Number
RV Components	BWRVIP-74-A	10/18/01	ML012920549
Core Shroud Support and Attachments	BWRVIP-38	03/01/01	ML010600211
Core Shroud	BWRVIP-76		
Core Support Plate	BWRVIP-25	12/07/00	ML003775989
Core Spray Lines and Spargers	BWRVIP-18	12/07/00	ML003775973
Top Guide	BWRVIP-26	12/07/00	ML003776110
Jet Pump Assemblies	BWRVIP-41	05/01/01	ML011310322
RV Lower Plenum Components	BWRVIP-47	12/07/00	ML003775765

The staff confirmed that the applicant has responded to the staff's renewal applicant actions items on these BWRVIP reports in LRA Appendix C. The staff noted that the staff's first three renewal applicant action items all dealt with: (a) identifying any deviations not conforming to the BWRVIP's recommended guidelines in these topical reports, (b) identifying any TSs that may require license amendments as a result implementing the BWRVIP guideline recommendations, pursuant to 10 CFR 50.90, and (c) ensuring the UFSAR supplement for the BWR Vessel Internals Program had incorporated a appropriate UFSAR supplement summary description for the BWRVIP recommended activities.

The staff evaluated the applicant's responses to the first three renewal applicant action items. With respect to the applicant's responses, the staff finds that the applicant had, in all cases, properly identified the renewal applicant action items and provided an acceptable basis for responding to and resolving them.

Beyond the first three renewal applicant action items, the staff finds that the applicant had in all cases properly identified the renewal applicant action items and provided an acceptable basis for responding to and resolving them, with the following exceptions:

In renewal applicant action item No. 5 on BWRVIP-25, the staff stated that "until such time as an expanded technical basis for not inspecting the rim hold-down bolts is approved by the staff, applicants referencing the BWRVIP-25 report for license renewal should continue to perform inspections of the rim hold-down bolts."

In response to renewal applicant action item No. 5 on BWRVIP-25, the applicant stated that the re-inspection strategy for SSES currently does not include any further bolt inspections. The applicant stated that this strategy is justified by the results of the baseline inspections, which found no crack indications, and a plant-specific analysis, which determined that adequate bolt preload will be retained after 60 years of operation, even if the bolts contain cracks. The applicant further stated that prior to entering the period of extended operation, PPL will either (a) request staff approval of the justification for not inspecting the core plate hold-down bolts, (b) implement a revised inspection strategy, approved by the staff, to ensure an adequate number of bolts are intact, and to prevent lateral displacement of the core plate, or (c) install core plate wedges to structurally replace lateral load resistance provided by the bolts.

The staff determines that the applicant has not included this re-inspection strategy commitment in the LRA Table A-1. However, in response to RAI 4.7.3-1, dated October 18, 2007, the applicant committed (Commitment No. 55) to either obtain staff approval for plant-specific analyses to justify not inspecting the bolts or to install core plate wedges.

On this basis, the staff finds that the applicant has properly addressed renewal applicant action item No. 5 on BWRVIP-25 and provided an acceptable basis for responding to and resolving it.

In renewal applicant action item No. 4 for BWRVIP-26, the staff stated that “Due to IASCC susceptibility of the subject safety-related components, applicants referencing the BWRVIP-26 report for license renewal should identify and evaluate the projected accumulated neutron fluence as a potential TLAA issue.”

In response to renewal applicant action item No. 4 for BWRVIP-26, the applicant stated that “accumulated neutron fluence for the top guide is not a TLAA for SSES. The top guide will exceed the threshold fluence levels for IASCC identified in BWRVIP-26-A. The aging effect is managed per the inspection recommendations in BWRVIP- 26-A. This strategy for managing IASCC in the top guide addresses the issue raised in renewal applicant action item No. 4 on BWRVIP-26 and will ensure that the proposed inspections will monitor for cracking in those top guide locations that have the highest probability of initiating IASCC.”

The neutron fluence methodology for the RVs and RV internal components has been approved by the staff and is assessed in SER Section 4.2.1. Based on this assessment, the staff concludes that the applicant has taken a conservative approach to managing IASCC of the top guides and further concludes that the applicant’s aging management strategy is an acceptable alternative to providing a beyond-CLB TLAA, as otherwise might have been done to satisfy renewal applicant action item No. 4 on BWRVIP-26. Therefore, renewal applicant action item No. 4 on BWRVIP-26 is considered resolved.

Operating Experience. The staff reviewed the applicant’s “operating experience” program element discussions in the BWR Vessels Internals Program and in the license renewal basis document for this AMP. The staff noted that the applicant has not identified any relevant SSES-specific or generic OE in the "operating experience" program element discussion for the BWR Vessels Internals Program. The staff also noted that the license renewal program documents for this AMP does include several CRs/Action Requests that reported the occurrence of flaw indications (cracks) in the core spray sparger brackets, core shroud circumferential welds and some of jet pump assembly components (i.e., jet pump restrainers, wedges, and rods). The staff also observed that the applicant has dispositioned these flaw indications as acceptable (i.e., "As-Is") for further service without the need for repair or replacement of the components at this time.

In RAI B.2.9-2, dated June 12, 2008, the staff requested that the applicant justify why the flaw indications in the core spray sparger brackets, core shroud welds, and jet pump assembly components have not been identified as relevant OE for the BWR Vessels Internals Program, and explain its basis for leaving the flaws in these components in service (i.e., acceptable "As-Is") without repair or replacement of the impacted components. The staff also requested that the applicant state, with a technical justification, what the inspection frequencies and sample sizes will be for re-inspecting these RV internal components, during the period of extended operation.

In the response to RAI B.2.9-2, dated July 14, 2008, the applicant stated that PPL has identified flaw indications in the core spray sparger brackets, core shroud welds, and jet pump assembly components. The applicant also stated that all identified flaws allowed to remain in-service (i.e., acceptable "As-Is") have been evaluated in accordance with the applicable BWRVIP documents. The applicant amended the LRA to add the relevant information to the “operating experience” program element of LRA Section B.2.9 as follows:

> For core shroud horizontal welds, initial indications were found in Units 1 and 2 in 1995. Subsequent inspections were performed in each outage since 1995. Most of the horizontal welds in both units exhibited some degree of cracking. To date, the flaws detected have been evaluated using the methods and criteria defined in BWRVIP-76, and found structurally adequate until the next inspection. Future inspections are scheduled for 2009 for Unit 2 and 2010 for Unit 1. Results of the inspection and evaluation determine the frequency of the next inspection.
>
> For core spray sparger brackets, a flaw was first identified in Unit 1 in 1996 and in Unit 2 in 1997. These flaws were reexamined in 2004 and 2005, and three more flaws were identified in the shroud plate base metal area. These flaws were evaluated using the guidance and criteria of BWRVIP-76 and found to have adequate structural margin. The core spray sparger brackets are currently inspected in every outage. Inspections in 2004 and 2005 did not find any growth in the flaws.
>
> The jet pump holddown beams on all Unit 1 and Unit 2 jet pumps were replaced in 1993 and 1994, respectively, in response to industry experience. In 2001, excessive jet pump wedge wear and set screw gaps were observed on the Unit 2 jetpumps. Similar observations were made in 2002 on Unit 1. In 2003 (for Unit 2) and 2004 (for Unit 1), modifications were installed, including machining labyrinth seals in 20 jetpump inlet mixers (to reduce flow induced vibration), replacing several wedges, and machining several restrainer bracket pads. Subsequent inspections have revealed additional minor wedge and rod wear. These components will continue to be monitored in accordance with B WR VIP-41, and repairs or modifications made as required to ensure the jet pumps are properly supported.

Based on the review, the staff finds the applicant’s response to RAI B.2.9-2 acceptable because the applicant has provided plant-specific operating experience relative to the BWR Vessel Internals Program. The staff determines that the applicant will perform inspections on these components at every outage, and the results will be evaluated using the guidance and criteria provided in staff-approved BWRVIP documents that determine the next set of inspections. Therefore, the staff’s concern described in RAI B.2.9-2 is resolved.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and the guidance found in SRP-LR Section A.1.2.3.10. Therefore, the staff finds this program element acceptable.

UFSAR Supplement. The applicant provided its UFSAR supplement summary for its BWR Vessel Internals Program in LRA Section A.1.2.10, Commitment No. 9. The staff confirms that the UFSAR supplement summary description for the BWR Vessel Internals Program conforms to the staff's recommended UFSAR supplement described in SRP-LR Table 3.1-2. The staff also confirms that by letter dated December 29, 2008, the applicant has committed (Commitment No. 9) to the enhancement of the program to implement augmented inspections of the SSES top guide grid beam and beam-to-beam crevice slot locations, during the period of extended operation. The staff finds the applicant's commitment for the augmented inspections of the top guide grid-to-beam and beam-to-beam locations are acceptable because they conform to the staff's recommended augmented inspection criteria in the "detection of aging effects" program element in GALL AMP XI.M9.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.10, when coupled with the letter dated November 25, 2008, provides an acceptable UFSAR supplement summary description of the applicant's BWR Vessel Internals Program because it is consistent with the SRP-LR and because the UFSAR supplement includes Commitment No. 9 on augmented inspection bases for top guide grid-to-beam and beam-to-beam locations.

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 the review of the applicant's BWR Vessel Internals Program and the applicant's response to the staff's RAIs, including deletion of the enhancement, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

3.0.3.2.5 Bolting Integrity Program

Summary of Technical Information in the Application. The LRA Section B.2.12 describes the existing Bolting Integrity Program as consistent, with five exceptions and one enhancement, with GALL AMP XI.M18, "Bolting Integrity." The Bolting Integrity Program includes, through other credited programs, the periodic inspection of bolting for indication of degradation such as leakage, loss of material, or cracking.

Prior to the period of extended operation, the Bolting Integrity Program will include a specific precaution against the use of sulfur (sulfide) containing compounds as a lubricant for bolted connections.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. During its on-site review, the staff reviewed the applicant's on-site documentation supporting the applicant's conclusion that the program elements are consistent with the elements in the GALL report. The staff also interviewed the applicant's technical staff.

The staff reviewed the enhancement and exceptions to determine whether the AMP, is adequate to manage the aging effects for which the LRA credits it.

In the LRA, the applicant stated that the AMP B.2.12 is an existing program that is consistent with GALL AMP XI.M18, “Bolting Integrity” with exceptions and an enhancement. The exceptions affect the scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria GALL Report program elements. The enhancement affects the preventive actions program element, and includes a precaution against using compounds containing sulfur as a lubricant for bolting.

During its on-site review, the staff reviewed the applicant’s on-site documentation supporting the applicant’s conclusion that the program elements are consistent with the elements in the GALL report. The staff interviewed the applicant’s technical staff and reviewed on-site documents.

In comparing the program elements in the applicant’s program to those in GALL AMP XI.M18, the staff found that the GALL Report “corrective actions” program element was not cited as including an exception even though the bolting integrity program does not explicitly address the guidelines outlined in EPRI NP-5769 as recommended by the GALL Report. By letter dated June 30, 2008 the staff issued RAI B.2.12-2 requesting the applicant provide more information on the basis for this exception.

By letter dated July 28, 2008, the applicant responded to RAI B.2.12-2 by stating that the AMP B.2.12 follows the guidelines and recommendations of EPRI NP-5067 and EPRI TR-104213, instead of EPRI NP-5769 and NUREG-1339, and revised its AMP B.2.12 description in the LRA to identify this as an exception to the corrective actions program element. Based on the amendments made to the LRA, the staff found the applicant’s response to be acceptable.

Exception 1

LRA Section B.2.12 states an exception to the following GALL Report program elements: scope of program, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria. Specifically, the exception stated:

> The inspection of structural bolting (including component support bolting) for indication of potential problems is accomplished under the Inservice Inspection (ISI) Program – IWF and Structures Monitoring Program, consistent with the corresponding NUREG-1801 items.

The staff reviewed the scope of the Bolting Integrity program in the GALL Report, and found that it primarily applies to the ASME code piping and components, including high strength bolting used in NSSS component supports where the actual yield strength is greater than 150 ksi. Other structural bolting used in supports, including expansion and anchor bolts are managed under ASME Code, Section XI, Subsection IWF (B.2.36) in accordance with GALL Report. The applicant stated that there is no high strength bolting where the actual yield strength is greater than 150 ksi. The staff finds that this 150 ksi limit is a specified value in the GALL Report wherein structural bolting with a yield strength below this value is not included in the scope of the AMP B.2.12. On the basis of its review as described above, the staff finds that this exception is acceptable.

Exception 2

LRA Section B.2.12 states an exception to the following GALL Report program elements: scope of program, and preventive actions. Specifically, the exception stated:

> The Bolting Integrity Program does not explicitly address the guidelines outlined in EPRI NP-5769 or as delineated in NUREG-1339. However, the Bolting Integrity Program does rely on the recommendations of the manufacturer/vendor and the industry, contained in EPRI documents NP-5067 and TR-104213, and will include a precaution against the use of any sulfur (sulfide) containing compound as a lubricant.

The staff reviewed the guidance documents, and determined that although EPRI TR-104213 is a guidance document endorsed by this GALL AMP XI.M18, however the guidance document EPRI NP-5067 is not specifically endorsed. By letter dated June 30, 2008, the staff issued RAI B.2.12-3 requesting additional information from the applicant detailing the differences between the guidance documents.

By letter dated July 28, 2008, the applicant responded to RAI B.2.13-3 by stating that although the AMP B.2.12 follows the guidelines and recommendations of EPRI NP-5067 and EPRI TR-104213, instead of EPRI NP-5769 and NUREG-1339, the Bolting Integrity Program still meets the intent of the GALL Report recommendations. The applicant referenced a point-by-point comparison of the two sets of documents dated April 1, 2005 (ML051020128). This comparison was previously accepted by the NRC, and found to adequately address the bolting guidelines in the GALL Report. Based on the justification provided, the staff finds the applicant's response to be acceptable.

<u>Exception 3</u>

LRA Section B.2.12 states an exception to the GALL Report program element parameters monitored or inspected. Specifically, the exception stated:

> Loss of preload/loss of pre-stress is not an aging effect requiring management for SSES bolting since SSES systems operate below the 700 °F threshold where stress relaxation becomes a plausible age-related concern. Improper bolting application or maintenance issues that might result in loss of preload are current plant operational (design) concerns, as supported by site operating experience, and are not related to aging.

The staff reviewed the GALL Report and SRP-LR on the management of loss of preload, and finds that the management of loss of preload is also addressed in the GALL Report program element, preventive actions. Proper maintenance practices requiring the application of an appropriate preload must exist. Additionally, the applicant states in its LRA that loss of preload is not an aging effect requiring management since it does not reach the 700 ^{o}F threshold at which loss of preload due to thermal effects aging mechanism occurs. However, loss of preload is identified in the GALL Report to include not only thermal effects, but also gasket creep and self loosening as other aging mechanisms. The aging mechanisms of gasket creep and self loosening are not properly discussed in this exception, and appears to imply that loss of preload due to gasket creep and/or self loosening are not accounted for by the applicant. Therefore, by letter dated September 23, 2008 the staff issued RAI B.2.12-5 requesting additional information from the applicant regarding the management of loss of preload.

By letter dated October, 22, 2008, the applicant responded to RAI B.2.12-5 by providing its technical basis for the exclusion of the loss of preload aging effect by addressing the three aging mechanisms which could lead to loss of preload- thermal effects, gasket creep, and self loosening. The applicant referenced EPRI document 1010639 which states that "Loss of preload is not an applicable aging effect". This document is not endorsed by the GALL AMP

XI.M18, and contradicts the GALL Report, which specifically identifies loss of preload as an aging effect with these three aging mechanisms. The staff recognizes that the conditions which lead to loss of preload by thermal effects may not exist at SSES, and also that indications for loss of preload are being monitored while monitoring for leakage, loss of material, and cracking. However, the guidance from the GALL AMP XI.M18 and EPRI NP-5067, which the applicant follows, indicates that loss of preload due to thermal effects, gasket creep, and self loosening is in fact an aging effect requiring management. The staff finds that though it is possible to monitor for indications of loss of preload such as leakage, the loss of preload aging effect still must be an aging effect which is managed by the AMP B.2.12. However the applicant's response to part (c) of RAI B.2.12-5 appears to directly contradict this important distinction.

The staff discussed their concerns with the applicant in a teleconference on October 27, 2008. By letter dated November 4, 2008, the applicant supplemented its response to RAI B.2.12-5, letter dated October, 22, 2008 by clarifying that although the loss of preload aging effect is not included in any of the AMR line items in the LRA, the AMP B.2.12 still "provides for the management of loss of preload for all in-scope, pressure-retaining bolted closures at SSES". With this distinction, the staff finds the applicant's response and exception to be acceptable.

<u>Exception 4</u>

LRA Section B.2.12 states an exception to the GALL Report program element monitoring and trending. Specifically, the exception stated:

> Periodic inspection of bolting, other than of the Class 1, 2 and 3 bolting performed by the Inservice Inspection (ISI) Program, is performed through the system Walkdown Program, including follow-up inspections if leakage is detected. The frequency of follow-up inspections is established by engineering evaluation of the identified problem. SSES operating experience has not shown a need for a set frequency (e.g., daily) applicable to all cases involving bolting.

The staff reviewed the GALL Report "monitoring and trending" program element and found that the recommendation for leak rate to be monitored on a particularly defined schedule was not clear in the applicant's bolting integrity program. Therefore, by letter dated June 30, 2008, the staff issued RAI B.2.12-1 requesting additional information on the applicant's leak rate monitoring schedule.

By letter dated July 28, 2008, the applicant stated that in cases of leakage on bolting connections for pressure retaining components (not covered by ASME Section XI), the inspection frequency is determined by engineering evaluation of the problem. The applicant stated that this is achieved at SSES through the plant minor deficiency monitoring program, which establishes the guidelines for identifying, monitoring, tracking, and disposition of minor deficiencies, such as leaks, that are discovered during walk downs. For any leak, an evaluation is completed to determine the actions required based on the severity of the leak and the potential to impact normal operations and safety. Furthermore, if the leak rate changes, further evaluation is performed to determine the actions required. Based on the justification provided, the staff found the applicant's response and exception to be acceptable.

<u>Exception 5</u>

LRA Section B.2.12 states an exception to the GALL Report program element acceptance criteria. Specifically, the exception stated:

> The program does not specify acceptance criteria for bolting. However, the Inservice Inspection (ISI) Program and the System Walkdown Program, through which the periodic visual inspection of mechanical components within the scope of license renewal are performed, do include acceptance criteria for evidence of degradation of components, including the bolting.

The staff finds that the applicant properly addresses the intent of the GALL Report program element acceptance criteria through the implementation of its corrective action program as well as through the acceptance criteria identified in the Inservice Inspection Program and System Walkdown Program. Therefore, the staff finds this exception to be acceptable.

Enhancement

LRA Section B.2.12 states an enhancement to the GALL Report program element preventive actions. Specifically, the enhancement stated:

> The program will include a specific precaution against the use of sulfure (sulfide) containing compounds, such as molybdenum disulfide (MoS2), as a lubricant for threaded fasteners (bolting), to further preclude the potential for stress corrosion cracking.

The staff reviewed EPRI-5769, Volume 1, Section 11 and found that it specifically identifies lubricants containing molybdenum disulfides as a common factor in several SCC related failures. The applicant's enhancement directly addresses this issue, as it commits to include a specific precaution against the use of compounds containing sulfur (sulfide), including molybdenum disulfide (MoS_2), as a lubricant for bolting. When implemented prior to the period of extended operation, AMP B.2.12 will be consistent with the recommendations of GALL AMP XI.M18. On the basis of the guidance of the GALL Report, the staff finds this to be acceptable.

Operating Experience: The staff also reviewed the operating experience described in LRA Section B.2.12. The applicant stated that "No instances of cracking or age-related loss of preload have been identified for bolting/fasteners, though some corroded bolting or facing surfaces (e.g., from general corrosion or leakage) have been identified at SSES." To verify the accuracy of this statement, the staff reviewed a sample of condition reports, 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. A 2002 condition report described the degraded condition of a total of 26 corroded bolts on the A1 and A2 diesel generator intercoolers. Upon further questioning of the applicant's staff and review of the CR, the staff discovered that the applicant performed additional investigation and evaluation to determine the root cause of the corroded bolts to be moisture and warm conditions. As a result, all 26 bolts were replaced, and proper corrective actions were demonstrated. This report as well as other condition reports reviewed by the staff during the audit helped to confirm the applicant's statement above, and helped to demonstrate that proper corrective actions are taken to address bolting issues.

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.1.2.2, Commitment No. 12, the applicant provided the UFSAR Supplement for the Bolting Integrity Program. The staff reviewed this section and finds it acceptable because it is consistent with the corresponding program description in SRP-LR Table 3.1-2.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).

The staff verified that, Commitment No. 12 in the LRA Table A-1, includes a brief description of the enhancement and committed to enhancing the program to include specific precautions regarding the use of lubricants for threaded fasteners prior to the period of extended operation.

Conclusion: The staff has reviewed the information provided in Section B.2.12 of the LRA Appendix B and additional information provided by the applicant by letters dated July 28, 2008, October 22, 2008 and November 4, 2008. On the basis of its review as discussed above, the staff concludes that the applicant has demonstrated 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. Also, the staff has 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 Report AMP to which it was compared. The staff concluded that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions of these components 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 concluded that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 Piping Corrosion Program

Summary of Technical Information in the Application. LRA Section B.2.13 describes the Piping Corrosion Program as an existing program that is consistent, with exceptions and enhancements, with GALL Report AMP XI.M20, Open-Cycle Cooling Water System. The applicant stated that this program fully meets the intent of NRC Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment." The applicant further stated that the program is a combination of condition monitoring program (consisting of inspections, surveillances, and testing to detect the presence of, and to assess the extent of, fouling and loss of material) and a mitigation program (consisting of chemical treatments and cleaning activities to minimize fouling and loss of material).

Staff Evaluation. During the audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's on-site documentation supporting the applicant's conclusion that the program elements are consistent with the elements in the GALL report. The staff also interviewed the applicant's technical staff.

In comparing the elements in the applicant's program to those in the GALL AMP XI.M27, the staff noted that the program elements in the applicant's AMP claimed to be consistent with the GALL were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M20 with the exception of the "scope of program" program element aspect as identified below that the staff determined was in need of additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report.

The staff reviewed the applicant's license renewal basis document and confirmed that the program scope includes the systems and components that could be affected by piping corrosion.

In LRA Table 3.2.2-7, Standby Gas Treatment System (SGTS), the Piping Corrosion Program is credited for managing the aging effect of loss of material for loop seal piping and valve bodies. However, a review of the license renewal basis document for the Piping Corrosion Program indicated that SGTS is not included in the scope of the Piping Corrosion Program. The staff issued RAI B.2.13-1 by letter dated May 30, 2008 requesting the applicant to justify why it is not included and to justify how the Piping Corrosion Program will manage the aging effects of these components in SGTS.

In the letter dated June 30, 2008, the applicant responded to RAI B.2.13-1 by amending the Piping Corrosion Program. This is discussed in the Enhancement 1 section.

The staff reviewed the exceptions and enhancements to determine whether the AMP, with the exceptions and enhancements is adequate to manage the aging effects for which the LRA credits it.

Exception 1

In LRA Section B.2.13, the applicant stated an exception to the “preventive actions” program element that system components are lined or coated only where necessary to protect the underlying metal surfaces. The GALL AMP XI.M20 recommends that system components are lined or coated.

The staff reviewed the GALL Report Volume 2 Chapter VII for the Open-Cycle Cooling Water System and noted that it includes piping, piping components and piping elements made of steel (with or without coatings), stainless steel and copper alloy materials. The GALL Report recognizes that steel components may be coated or uncoated. Based on this review, the staff finds the exception acceptable because the applicant is using materials that are appropriate for the system and has lined or coated steel where necessary to protect the underlying material.

Exception 2

In LRA Section B.2.13, the applicant stated an exception to the “monitoring and trending” program element that inspection frequencies are based on operating conditions and past history; flow rates, water quality, lay-up and heat exchanger design. The GALL AMP XI.M20 recommends testing and inspections be performed annually and during refueling outages.

The staff issued RAI B.2.13-5 by letter dated May 30, 2008 to request the applicant to confirm if these frequencies are in accordance with the information provided in GL 89-13 concerning a routine inspection and maintenance program and section D, “frequency of testing and maintenance,” in GL 89-13, Supplement 1, and if not, to justify why the GALL recommended frequencies are not followed.

In the letter dated August 22, 2008, the applicant responded to RAI B.2.13-5 stating that the inspection frequencies are in accordance with PPL commitments under NRC GL 89-13. The applicant further stated that inspection and cleaning frequencies are based on PPL heat exchanger’s operating conditions and past history with flow rates, water quality, layup, and heat exchanger design all being considered. The applicant further stated that the frequency has been established in order to identify inherent problems before failures occur. In its response to GL 89-

13 (PLA-3349, dated February 23, 1990), the applicant stated that "instead of conducting a testing program PPL committed to replacing the cooling coils of difficult to inspect heat exchangers, laboratory testing of a fouled coil and a prototype of the replacement coil, and a comprehensive program that includes scheduling of maintenance, methods of cleaning, inspection criteria, reporting, and personnel qualification. Based on past monitoring, PPL has demonstrated that existing activities and their frequency have been acceptable to detect degradation prior to the loss of component intended function and will remain adequate for the period of extended operation. The frequency of inspections is in accordance with the information provided in NRC GL 89-13."

The staff reviewed NRC GL 89-13 Supplement 1, Section III.D.3, which states, "Frequent regular maintenance is an acceptable alternative to Recommended Action II, which calls for heat exchanger performance testing. A licensee or applicant can choose to routinely maintain the heat exchangers instead of testing them. Either the frequency of maintenance or the frequency of testing should be determined to ensure that the equipment will perform the intended safety functions during the intervals between maintenance or tests." The staff also reviewed the applicant response to the NRC GL 89-13 and also reviewed the results of the laboratory testing that the applicant had attached to GL 89-13 response.

The staff noted that GL 89-13 Supplement 1 provides for regular maintenance and testing as an alternate for performance testing. The staff also noted that the applicant performs periodic inspection in accordance with its response to GL 89-13, has considered flow rates, water quality, layup, and heat exchanger design when determining the frequency, and has addressed appropriate inspection and acceptance criteria. The staff reviewed the plant OE and noted that the applicant has identified and documented age related degradation as found during various inspection activities. On this basis, the staff finds that the frequencies as established by the applicant are appropriate and the Piping Corrosion Program will adequately manage age related degradation through the period of extended operation. The staff finds the applicant response to RAI 2.13-5 to be acceptable and finds this exception to GALL AMP XI.M20 to be acceptable.

<u>Exception 3</u>

In the letter dated June 30, 2008, the applicant amended the application to include an additional exception to the Piping Corrosion Program in the "scope of program" element as follows:

> NUREG-1801 states that the guidelines of NRC GL 89-13 include a test program to verify heat transfer capabilities. There is no test program at SSES to verify the heat transfer capability. In response to GL 89-13, PPL conducted laboratory testing of cooling coils to demonstrate adequate heat transfer capability.

The applicant had performed laboratory testing of a representatively fouled ECCS room cooler cooling coil, and of prototypes representing replacement cooling coils, under post-accident conditions that demonstrated adequate heat transfer capability. This is documented in PPL correspondence to NRC via PLA-3776, dated June 11, 1992 that provided the 5/92 Confirmatory response to NRC GL 89-13. Additionally, the applicant has been monitoring heat exchangers in response to GL 89-13 and has demonstrated that existing activities are able to detect degradation prior to loss of component intended function and will remain adequate for the period of extended operation.

The staff reviewed the above referenced applicant correspondence and the OE discussion that was provided in the applicant's license renewal basis document for the Piping Corrosion

Program. On the basis that the applicant has met the GL 89-13 recommended actions and OE has demonstrated that the program activities can detect aging degradation prior to loss of component intended function, the staff finds the applicant response acceptable and finds this exception to GALL AMP XI.M20 to be acceptable.

Based on the review, the staff finds the applicant's Piping Corrosion Program acceptable because it conforms to the recommended GALL AMP XI.M20, Open-Cycle Cooling Water System with enhancements and exceptions.

Enhancement 1

In the letter dated June 30, 2008, the applicant responded to RAI B.2.13-1 that the LRA Table correctly credited the Piping Corrosion Program and the basis document should have included the SGTS loop seals in the scope of the Piping Corrosion Program.

The applicant amended the LRA Section B.2.13, Piping Corrosion Program with an enhancement in the "scope of program" program element to include the STGS loop seals. Similar changes were made to the UFSAR Supplement Section A.1.2.38 and the commitment No.13 in LRA Table A-1.

The applicant also stated that the internal environment for the loop seals is raw water from the service water system and upon inclusion of the loop seals within the scope of the program, they will be monitored and inspected for loss of material in accordance with the specifications.

The staff reviewed the response and the associated changes to the LRA and finds the response and the changes acceptable because the applicant correctly added the SGTS loop seals to the scope of the program. The staff concurs that with the inclusion of the loop seals within the scope of the program, the Piping Corrosion Program will adequately manage the aging effects of these components similar to the other service water system components that are included in the scope of this program. Based on this review, the staff finds the enhancement acceptable because implementation of the enhancement will make the Piping Corrosion Program consistent with the GALL AMP XI.M20, Open-Cycle Cooling Water System.

Enhancement 2

In the letter dated October 21, 2008, in response to NRC regional inspection of the LRA, the applicant added the following enhancement to the "monitoring and trending" program element of LRA Section B.2.13.

> The program will incorporate performance, documentation and trending of opportunistic visual inspections (during normal maintenance/repair activities).

The applicant also revised the UFSAR supplement and Commitment No. 13 to include this enhancement.

The staff reviewed the enhancement and associated changes and finds the response and the changes acceptable because the implementation of the enhancement will make the Piping Corrosion Program consistent with the GALL AMPXi.M20, Open-Cycle Cooling Water System for monitoring and trending of the inspection results.

The staff noted that the current "scope of program" program element, as described in the LRA, does not include commitments for two GL 89-13 guidelines incorporated in GALL AMP XI.M20. The specific components of the GL 89-13 program missing from the Piping Corrosion Program are a system walkdown inspection to ensure compliance with the CLB and a review of maintenance, operating, and training practices and procedures. The staff issued RAI B.2.13-2 by letter dated May 30, 2008 requesting the applicant to justify why this not an exception to the GALL AMP.

In the letter dated June 30, 2008, the applicant responded to RAI B.2.13-2 that the program description for GALL AMP XI.M20 states that the Open-Cycle Cooling Water System Program relies on implementation of the recommendations of GL 89-13. The applicant had provided responses to GL 89-13 via a series of correspondence with the NRC. The recommended action in GL 89-13 for system walkdown was documented in PPL correspondence to the NRC via PLA-3349 dated February 23, 1990, and PLA-3489 dated December 14, 1990. PLA-3349 also documented the recommended action for the review of the procedures. These two actions are one-time actions arising out of GL 89-13 and are unrelated to aging management.

The staff reviewed the response and the referenced applicant correspondence and finds that the applicant has taken the appropriate actions as recommended by GL 89-13 and is consistent with the GALL AMP XI.M20 program description and therefore has justified why an exception to the GALL AMP is not required. Based on this review, the staff finds the applicant's response acceptable.

In a response to GL 89-13, SSES took an exception to heat transfer capability testing. The GALL AMP XI.M20, in the parameters monitored/inspected program element, recommends testing to ensure heat transfer capabilities. In LRA section B.2.13, the applicant has not taken an exception to this program element. The staff issued RAI B.2.13-3 by letter dated May 30, 2008 requesting the applicant to justify why no exception is taken in the application.

In a letter dated June 30, 2008, the applicant responded to RAI B.2.13-3 that there is no test program at SSES to verify heat transfer capability. The applicant amended the application to include an additional exception to the Piping Corrosion Program in the "scope of program" element. The staff evaluates this exception under Exception 3.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.13 and interviewed the applicant's technical personnel to confirm that the plant-specific OE did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific OE have been reviewed by the applicant and are evaluated in the GALL Report.

In the "operating experience" program element of LRA Section B.2.13, the LRA states that SSES has programs in place with OE to demonstrate that the effects of aging on the service water systems, and on the safety-related heat exchangers that they serve, will be effectively managed during the period of extended operation. The staff issued RAI B.2.13-4 by letter dated May 30, 2008 requesting the applicant to provide some specific examples of issues that were found in the condition reports.

In the letter dated June 30, 2008, the applicant responded to RAI B.2.13-4 by providing several specific examples of OE. These included service water piping leaks, UT pipe wall thickness measurements that were below minimum requirements, tube wall erosion found during eddy current testing, erosion damage on end covers of heat exchangers, pitting damage on stator coolers and coatings damage on the waterbox divider. These were found during performance of testing and inspections of piping and heat exchangers. The staff finds that the applicant has provided specific plant OE and taken the appropriate corrective action to demonstrate that the effects of aging on the service water systems, and on the safety-related heat exchangers that they serve, will be adequately managed during the period of extended operation. Based on this review, the staff finds the applicant response acceptable.

The staff also reviewed the applicant's "operating experience" described in the applicant's license renewal basis document for the Piping Corrosion Program. The staff reviewed a sample of condition reports and confirmed that the applicant had identified age related degradation and implemented appropriate corrective actions.

Furthermore, the staff confirmed that the applicant has addressed OE identified after the issuance of the GALL Report. The staff finds that the applicant's Piping Corrosion Program, with has been effective in identifying, monitoring, and correcting the effects of age related degradation in service water piping systems and can be expected to ensure that effects of aging will be adequately managed during the period of extended operation.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A1.2.38, Commitment No. 13, the applicant provided the UFSAR supplement for the Piping Corrosion Program. The staff verified that the UFSAR supplement summary description for the Piping Corrosion Program was in conformance with the staff's recommended UFSAR supplement for the Open-Cycle Cooling Water System Program provided in Table 3.3-2 of the SRP-LR.

In the letters dated June 30, 2008 and October 21, 2008, the applicant amended the UFSAR supplement to include the enhancements to add Stand-By Gas Treatment System loop seals to the scope of the program and to incorporate performance, documentation and trending of opportunistic inspections and revised Commitment No. 13 in Table A-1 accordingly.

Based on this review, the staff finds that UFSAR supplement Section A1.2.38 as amended, provides an acceptable UFSAR supplement summary description of the applicant's Piping Corrosion Program because it is consistent with those UFSAR supplement summary description in the SRP-LR for the Open-Cycle Cooling Water System 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. Based on the review of the applicant's Piping Corrosion Program and the applicant's response to the staff RAIs, the staff finds all program elements consistent with the GALL Report. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which the LRA credits it. Also, the staff reviewed the enhancements and confirmed that its implementation through Commitment No. 13 prior to the period of extended operation would make the existing AMP consistent with the GALL Report AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement as amended 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 Closed Cooling Water Chemistry Program

Summary of Technical Information in the Application. LRA, Section B.2.14 describes AMP B.2.14 “Closed Cooling Water Chemistry Program” as an existing program that is consistent with the GALL AMP XI.M21 “Closed-Cycle Cooling Water System” with an exception to the following program elements, “parameters monitored/inspected”, “detection of aging effects”, “monitoring and trending” and “acceptance criteria.”

The applicant stated that this program is a mitigation program for damage due to loss of material and cracking for components within the closed cooling water system or are components that are served by the closing cooling water system that are exposed to treated water. The applicant also stated that the program is consistent with EPRI water chemistry guidelines that manage conditions that could lead to loss of material or cracking with the use of proper monitoring and corrosion inhibitors.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the Gall Report. AMP XI.M21, “Closed-Cycle Cooling Water System“ with an exception to the following program elements: parameters monitored/inspected, detection of aging effects, monitoring and trending and acceptance criteria.

In comparing the seven programs elements in the applicant’s program to those in GALL AMP XI.M21, the staff noted that the program elements in the applicant’s AMP claimed to be consistent with the GALL Report were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M21 with the exception of one (1) program element, “operating experience,” and those exceptions taken by the applicant that the staff felt there was a need for additional clarification and for which RAIs were issued. The staff also issued an RAI to clarify statements made by the applicant in LRA Section B.2.14 pertaining to a supplemental one-time inspection. The “operating experience” program element is discussed separately below.

Based on the staff’s review of LRA Section B.2.14, the staff noted that the applicant states that the Closed Cooling Water Chemistry Program is supplemented by a one-time inspection to ensure the effectiveness of the program, either the AMP B.2.22 “Chemistry Program Effectiveness Inspection” or the AMP B.2.24 “Heat Exchanger Inspection.” The staff determined that clarification was needed and, therefore, by letter dated July 10, 2008, the staff issued RAI B.2.14-2 requesting the applicant to clarify if the appropriate one-time inspection will be performed for all AMR Type-2 line items credited with using AMP B.2.14 and to identify which one-time inspection, if any, will be used for any applicable AMR Type-2 line items that credit AMP B.2.14 for aging management. The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, “Chemistry Program Effectiveness Inspection” will be used to supplement AMP B.2.14, “Closed Cooling Water Chemistry Program” in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff noted that the one-time inspection will not be performed on the Diesel Jacket Water Cooling System because corrosion monitoring probes were installed to identify actual corrosion rates. The staff further noted that these probes were installed following an inspection performed at the same time as a 20-year overhaul of the system. The staff confirmed that the applicant amended the LRA to indicate that AMP B.2.22 will supplement AMP B.2.14, in order to perform a one-time inspection to identify degradation or confirm the lack of degradation. On the basis of its review, the staff finds the applicant's response acceptable because the applicant has clarified that the AMP B.2.22, "Chemistry Program Effectiveness Inspection" is the one-time inspection that will supplement AMP B.2.14, unless otherwise noted, which will be capable of identifying any evidence or confirm the lack of any degradation that is occurring that may affect the intended functions of those components that credit AMP B.2.14 for aging management, during the period of extended operation.

The staff reviewed the exception to determine whether the program, with exception, is adequate to manage the aging effects for which it is credited.

Exception

GALL AMP XI.M21 recommends the use of performance and functional testing to ensure the "acceptable functioning" of the closed cooling water system or components served by this system. The staff noted that the applicant's program takes an exception to the "parameters monitored/inspected" "detection of aging effects", "monitoring and trending" and "acceptance criteria" program elements in that performance and functional testing will not be performed.

The staff also noted that the applicant's program will monitor the emergency diesel generator jacket water subsystem and heat-exchangers served by the closed cooling waters which are supplemented by a one-time inspection to confirm the effectiveness of AMP B.2.14. Therefore, by letter dated July 10, 2008 (ML081890576) the staff issued RAI B.2.14-1 requesting the applicant to clarify whether or not performance and functional testing are within the scope of the closed cooling water chemistry program, and if not to provide the basis for not including them in the scope of the program. The staff further asked the applicant in RAI B.2.14-1 to clarify whether the one-time inspection is being performed instead of the periodic inspections recommended in GALL AMP XI.M21 and if so, to justify how a one-time inspection is capable of accomplishing the same tasks as the periodic inspections recommended by the GALL Report. Additionally, the staff asked the applicant to clarify how a one-time inspection would be capable of trending corrosion data for the components within scope of the program when only one round of inspections are performed.

The applicant responded to RAI B.2.14-1, in a letter dated August 12, 2008. In this letter the applicant stated that the conditions that could lead to and the spread of loss of material and cracking are managed by the proper control and monitoring of corrosion inhibitors in accordance with EPRI water chemistry guidelines. The applicant further stated that system parameters would only be affected when the degradation in the system had progressed to a significant amount. The staff noted that the applicant will control the water chemistry in accordance with EPRI guidelines, industry and plant-specific OE and periodic evaluation of the water chemistry parameters. The staff noted that the applicant has performed a review of its plant-specific OE, which indicated that the aging effects of loss of material and cracking are not expected to occur and the Closed Cooling Water Chemistry Program has been effective is mitigating these aging effects. The applicant stated in the LRA that they will be performing a one-time inspection with the AMP B.2.22 "Chemistry Program Effectiveness Inspection" to identify evidence or confirm the lack of any degradation that is occurring that may affect the intended functions of these components during the period of extended operation. The applicant stated that this one-time inspection will inspect a representative sample of components that are exposed to low flow and stagnant areas where accumulation of contaminants might occur making these components more susceptible to loss of material and components that are exposed to temperatures greater than $140^{o}F$ which are susceptible to cracking. The staff noted that this one-time inspection will utilize a combination of volumetric and visual inspection techniques (such as VT-1 or VT-3). The staff noted that in most cases the use of functional and performance testing will verify that the component's active functions can be accomplished. The staff further noted that testing the active functions of components with performance and functional testing are governed by the requirements of the Maintenance Rule (10 CFR 50.65). By letter dated September 30, 2008 as a result of a NRC Regional Inspection the applicant amended this exception in LRA Section B.2.14 in which the applicant clarified that periodic inspections will not be performed, however based on the implementation and inspection results from the one-time inspection that will be performed as part of AMP B.2.22 this may result in the establishment of periodic inspection activities. On the basis of its review, the staff finds the applicant's response acceptable because (1) the applicant will be monitoring and maintain the water chemistry in accordance with EPRI guidelines (2) will be performing a one-time inspection in accordance with the recommendations of GALL AMP XI.M32 "One-Time Inspection" to identify evidence or confirm the lack of any degradation that is occurring that may affect the intended functions of the these components during the period of extended operation and (3) the applicant may establish periodic activities based on the implementation and inspection results from the one-time inspection performed as part of AMP B.2.22.

On the basis of its review, the staff finds the applicant's exception acceptable because (1) the applicant will monitor and maintain water chemistry in accordance with the EPRI guidelines to mitigate loss of material and cracking which has been proven to be successful based on plant-specific OE, (2) the applicant will be performing a one-time inspection in accordance with the recommendations of GALL AMP XI.M32 "One-Time Inspection" for the aging effects of loss of material and cracking, and (3) the applicant will be selecting representative sample of components with low-flow and stagnant areas which are more susceptible to degradation because of accumulating contaminants for the one-time inspections.

Operating Experience. The staff reviewed the applicant's OE described in the applicant's license renewal basis document for the Closed Cooling Water Chemistry Program. The applicant stated in the LRA that this program incorporates EPRI closed cooling water guidelines and also has been incorporating site-specific and industry wide OE. The staff noted that the applicant performs periodic external and internal assessments of the program's performance to identify any strengths and adverse trends.

During its review, the staff noted that the OE revealed issues with the diesel jacket water corrosion/microbiological control in 1999 and some degradation of components were noted by inspections during a 20-year overhaul during the same time period. The applicant took corrective actions by flushing the jacket water and considered different biocide/corrosion inhibitor treatments. The staff noted that the applicant installed instantaneous corrosion probes to monitor corrosion rates. However the staff determined that additional information was needed for its review and therefore, by letter dated July 10, 2008 the staff issued RAI B.2.14-3 requesting the applicant to clarify whether the addition of alternative biocides or corrosion inhibitors was actually implemented as a corrective action for the diesel jack water system components that are exposed to closed cooling water. If so, clarify whether any supplemental inspections have been performed since the time of the change in the biocide control compound or corrosion inhibitor to verify its effectiveness in managing microbiological organism growth or corrosion of the component surfaces that are exposed to closed cooling water; if not, and a change in biocide control compound or corrosion inhibitors is planned, clarify when the change will be performed and whether any supplemental inspections are planned to confirm its effectiveness to mange microbiological organism growth or corrosion in the components. The applicant responded to RAI B.2.14-3, by letter dated August 12, 2008. The applicant stated that during 1999 the biocide treatment used by SSES was glutaraldhyde, but was discontinued and changed to the alternative biocide isothiazoline. The staff noted that this alternative biocide is currently in use and since its implementation in 1999, the more recent supplemental inspections of the diesel generators have indicated no significant degradation. The applicant stated that the supplemental inspections were performed to confirm the effectiveness of this new biocide treatment. The applicant stated that the recent review in 2007 of the water chemistry samples have shown that the chemistry parameters have been maintained in specification, corrosive metal levels are low, and biological activity is negligible. On the basis of its review, the staff finds the applicant's response acceptable because the applicant took corrective actions with the use of alternate biocide treatments following the discovery of degradation in the diesel jacket cooling water system and recent inspections have shown no significant degradation in the system.

The staff finds the applicant's Closed Cooling Water Chemistry Program has been effective in identifying, monitoring and correcting the effects of aging and the existing program OE did not reveal any degradation not bounded by industry experience.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. The staff reviewed the UFSAR Supplement summary description that was provided in LRA Section A.1.2.13, Commitment No. 45, for the Closed Cooling Water Chemistry Program. The staff verified that, in LRA Commitment No. 45 of UFSAR Supplement Table A-1, the applicant committed to the ongoing implementation of the Closed Cooling Water Chemistry Program for aging management of those in-scope components that the AMP is credited. The staff also verified that the applicant has placed this commitment on UFSAR Supplement summary description A.1.2.13 for the Closed Cooling Water Chemistry Program.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.13 provides an acceptable UFSAR Supplement summary description of the applicant's Closed Cooling Water Chemistry Program because it is consistent with the UFSAR Supplement summary description in the SRP-LR and because the summary description includes the bases for determining that aging effects will be managed. Therefore, the staff concludes that the UFSAR supplement for this AMP provides an adequate summary description of the program, as described by 10 CFR 54.21(d).

Conclusion. On the basis of the review of the applicant's Closed Cooling Water Chemistry Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. The staff reviewed the exception , the justification and determined that the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. In addition the staff reviewed the applicant's responses to the staff's RAI and its evaluation is documented above. 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 Fire Protection Program

Summary of Technical Information in the Application. LRA Section B.2.16 describes the Fire

Protection Program as an existing program that is consistent with an exception with GALL Report AMP XI.M26, Fire Protection. The applicant stated that this program performs periodic visual inspections and functional tests, as appropriate, of fire dampers, fire barrier walls, ceilings and floors, fire rated penetration seals (fire stops), fire wraps, fireproofing, and fire doors to ensure that functionality and operability are maintained.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. In comparing the elements in the applicant's program to those in GALL AMP XI.M26, the staff noted that the program elements in the applicant's AMP claimed to be consistent with GALL were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M26 The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. Onsite interviews were also held to confirm these results.

The staff reviewed the exception to determine whether the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it.

Exception 1

In the LRA, the applicant identified the following exception to the "scope", "parameters monitored/inspected", "detection of aging effects", "monitoring and trending" and "acceptance criteria" program elements:

> With respect to the halon/carbon dioxide (CO2) suppression systems and the fuel oil supply line for the diesel-driven fire pump, inspections and tests included in the Fire Protection Program (and addressed in the Technical Requirements Manual) are not credited with aging management but do provide for periodic observation of the related components. While halon/CO2 and fuel supply line internal conditions are not directly inspected or evaluated during these tests and inspections, they do provide indirect confirmation of whether degradation has occurred, prior to a loss of function.

The staff issued RAI B.2.16-1 by letter dated May 30, 2008 requesting the applicant to provide justification why these tests and inspections are not credited for license renewal, and why the internal surfaces are not inspected.

In the letter dated June 30, 2008, the applicant stated in response to part a.1 of RAI B.2.16-1 that Halon/CO_2 spray nozzles, tubing and valve body fabricated from stainless steel and copper alloy are not susceptible to aging in indoor air environment. The staff reviewed the GALL Report and noted that items VII.J-15 and V.F-3 identify no aging effects for stainless steel and copper alloy material in indoor air external environment. The applicant stated in part a.2 of RAI B.2.16-1 that consistent with the GALL Report, there are no aging effects for material in a dry gas internal environment. The staff reviewed the GALL Report and noted that items VII.J-4 and VII.J-19 identify no aging effect for a dry gas environment. The applicant further stated in part a.3 of RAI B.2.16-1 that the System Walkdown Program is credited for managing the aging effects on the external surfaces of steel components in Halon/CO_2 system. The staff noted that this is consistent with the GALL Report that recommends the GALL AMP XI.M36, External Surfaces Monitoring.

The applicant finally stated in response to part b of RAI B.2.16-1 that for the diesel engine-driven fire pump, the Fuel Oil Chemistry and Chemistry Effectiveness Programs are credited to manage the aging effects. The staff reviewed LRA Table 3.3.2-13 and noted that aging effects of copper tubing in a fuel oil environment is managed by the Fuel Oil Chemistry and Chemistry Effectiveness Inspection Programs, which is consistent with the GALL Report.

Because the applicant is consistent with the GALL Report recommendations, the staff finds the applicant response acceptable and concurs that because there are no aging effects, the internal surfaces of Halon/CO_2 system components do not need to be inspected and the internal surfaces of diesel engine-driven fire pump tubing are inspected as part of the sample population in the Chemistry Effectiveness Inspection Program. Based on this review, the staff finds this exception acceptable.

Based on the review of the exception, and resolution of the related RAI as described above, the staff finds the Fire Program consistent with program elements of GALL AMP XI.M26, with acceptable exceptions, and therefore acceptable.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.16 and interviewed the applicant's technical personnel to confirm that the plant-specific OE did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific OE have been reviewed by the applicant and are evaluated in the GALL Report.

The staff also reviewed the applicant's OE described in the applicant's license renewal basis document for the Fire Protection Program. The staff reviewed a sample of condition reports and confirmed that the applicant had identified age related degradation and implemented appropriate corrective actions. The staff found examples of fire door issues, penetration seal cracking and fire door seal degradation. The staff noted that several condition reports have been written against fire door degradation that determined that the fire door degradations were related to human performance and inadequate fire door installation. Isolated cases of fire rated penetration seal cracking and fire door seal degradation have also been identified. Corrective actions included additional personnel training, repair, and/or replacement activities. The staff did not find any age related degradation in Halon/CO_2 systems.

Furthermore, the staff confirmed that the applicant has addressed OE identified after the issuance of the GALL Report. The staff finds that the applicant's Fire Protection Program, with the corrective actions discussed in the LRA, has been effective in identifying, monitoring, and correcting the effects of age related degradation in fire protection systems and can be expected to ensure that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis 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. In LRA Section A1.2.18, Commitment No. 15, the applicant provided the UFSAR supplement for the Fire Protection Program. The staff verified that the UFSAR supplement summary description for the Fire Protection Program was in conformance with the staff's recommended UFSAR supplement for the Fire Protection Program provided in Table 3.3-2 of the SRP-LR. In Table A-1, the applicant has committed via Commitment No. 15 to implement the existing program through the period of extended operation.

Based on this review, the staff finds that UFSAR supplement Section A1.2.18 provides an acceptable UFSAR supplement summary description of the applicant's Fire Protection Program because it is consistent with those UFSAR supplement summary description in the SRP-LR for the Fire Protection 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 the review of the applicant's Fire Protection Program and the applicant's response to the staff's RAI, the staff finds all program elements consistent with the GALL Report. In addition, the staff reviewed the exception and its justification and determines that the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Fire Water System Program

Summary of Technical Information in the Application. LRA Section B.2.17 describes the Fire Water System Program as an existing program that is consistent with enhancements with the GALL Report AMP XI.M27, Fire Water System. The applicant stated that this program performs periodic inspection and testing of the water-based fire suppression systems including hydrant and hose station inspections, fire main flushing, flow tests, and sprinkler inspections. The applicant also stated that tests and inspections are generally in accordance with the applicable National Fire Protection Association (NFPA) recommendations.

Staff Evaluation. During its audit the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancements to determine whether the AMP, with the enhancements is adequate to manage the aging effects for which the LRA credits it. In comparing the elements in the applicant's program to those in the GALL AMP XI.M27, the staff noted that the program elements in the applicant's AMP which claimed to be consistent with the GALL Report were consistent with the corresponding program element. However the "scope of program" program element aspect as identified below the staff determined needed additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced the GALL Report. Onsite interviews were also held to confirm these results.

The LRA credits the Fire Water System Program for managing loss of material for valve bodies (deluge) in the Standby Gas Treatment System (SGTS). However, the staff noted the STGS is not included in the list of systems in the scope of this program, as identified in the program basis document. The staff issued RAI B.2.17-1 by letter dated May 30, 2008 requesting the applicant to clarify why the SGTS is not in-scope.

In the letter dated June 30, 2008, the applicant responded to RAI B.2.17-1 by stating that the SGTS components are included in the scope of the Fire Water System Program. The applicant also stated that these components include piping and valves associated with deluge of the charcoal absorbers. However, since LRA Table 3.2.2-7 only addressed deluge valves, the LRA Table was amended to include carbon steel deluge piping. The applicant also stated that it credited the Fire Water System Program to manage loss of material for internal surfaces in a raw water environment, and the System Walkdown Program to manage loss of material of external surfaces in an indoor air environment.

Because the added AMR line item is consistent with the GALL Report line VII.G-24 for internal surfaces, and V.B-3 for external surfaces, the staff finds the addition of this line to be acceptable. However, the response did not indicate whether the LRA will be amended to include the SGTS within the scope of the program or provide justification why it was not included. The staff issued a follow-up RAI B2.17-1R by letter dated July 23, 2008, to resolve this issue.

In the letter dated August 22, 2008, the applicant responded to RAI B2.17-1R by stating that LRA Section B.2.17, Fire Water System Program is an existing program. The specific systems within the scope of the program are not included in the LRA, however, these systems are identified in the program basis document. The applicant acknowledged that the SGTS should have been included in the program basis document, but was inadvertently omitted. The applicant stated that the deluge valves and piping, located in the fire protection lines to the high efficiency charcoal adsorber filters, were evaluated with SGTS but is subject to the raw water environment of the fire protection system and therefore credited the Fire Water System Program. The applicant also stated that the SGTS deluge valves and piping are included in the LRA Table 3.3.2-7, are identified in the Technical Requirements manual Table 3.7.3.2-1, and are included in the fire water system procedure that performs the 18-month functional test and the 18-month visual inspection of the SGTS deluge system.

The staff noted that the valves and piping in question are located in an environment of fire water but evaluated in the SGTS aging management review, and that these lines are included in the fire protection system testing and inspection procedures as per the requirements in the Technical Requirements Manual. On this basis, the staff finds that enhancement to the program is not needed and finds the applicant response to be acceptable.

LRA Table 3.3.2-13 credits the Fire Water System program to manage reduction in heat transfer for heat exchanger tubes. However, LRA Section B.2.17 states that this program is consistent with the GALL AMP XI.M27, which focuses on managing the aging effect of loss of material and not reduction in heat transfer. The staff issued RAI B.2.17-2 by letter dated May 30, 2008 requesting the applicant to justify how this program will manage reduction in heat transfer.

In the letter dated June 30, 2008, the applicant responded to RAI B.2.17-2 by stating that upon further consideration, the Heat Exchanger Inspection Program has been identified as a more appropriate program for managing reduction of heat transfer for the diesel engine driven fire pump heat exchangers. The applicant amended the LRA to credit the Heat Exchanger Inspection Program in lieu of the Fire Water System Program. The evaluation of the Heat Exchanger Program is documented in SER Section 3.0.3.1.12.

The staff reviewed the enhancements to determine whether the AMP, with the enhancements, is adequate to manage the aging effects for which the LRA credits it.

Enhancement 1

In LRA Section B.2.17, the applicant added a program requirement in the “detection of aging effects”, “monitoring and trending”, and “acceptance criteria” program elements to require testing or replacement of sprinkler heads in service for 50 years

The GALL AMP XI.M27 recommends testing or replacement of sprinkler heads in service for 50 years. On the basis that the enhancement, when implemented, will make the Fire Water System

Program consistent with the GALL Report, the staff finds the enhancement acceptable.

Enhancement 2

In LRA Section B.2.17, the applicant added a program requirement in the "parameters monitored or inspected" and "detection of aging effects" program elements to perform ultrasonic testing of representative portions of above ground fire protection piping that are exposed to water but do not normally experience flow.

By letters dated June 30, 2008 in response to RAI B.2.17-3 and October 21, 2008, in response to NRC regional inspection of the LRA, the applicant amended the LRA to revise enhancement 2 as follows:

> Ultrasonic testing of representative portions of above ground fire protection piping that are exposed to water but do not normally experience flow, are associated with a dry-piping sprinkler system and may contain stagnant water, or is pre-action or deluge piping that is normally dry, but may have been wetted and not completely dry, will be performed after the issuance of the renewed license but prior to the end of the current operating term and at reasonable intervals thereafter, based on engineering review of the results.

The GALL AMP XI.M27 recommends wall thickness evaluations of fire protection piping using non-intrusive testing (e.g., ultrasonic testing) to identify loss of material due to corrosion. By performing this testing on piping that does not normally experience flow, or may contain stagnant water or may have been wetted but not completely dry, the applicant has selected locations that would experience a more aggressive internal environment than piping with full flow. On the basis that the enhancement, when implemented, will make the Fire Water System Program consistent with the GALL Report, the staff finds the enhancement acceptable.

Enhancement 3

By letter dated October 21, 2008, in response to NRC regional inspection of the LRA, the applicant amended the LRA to add another enhancement as follows:

> Also, within the 10-year period prior to the period of extended operation, at least one visual inspection (opportunistic or focused) of the internal surface of buried fire water piping will be performed. In addition, at least one inspection per year of 'wet' fire protection piping for wall thickness and pipe blockage will be performed if no opportunistic inspection has been completed.

The applicant also revised the UFSAR supplement and the commitment list to include this enhancement.

The GALL AMP XI.M27 recommends that as an alternative to non-intrusive testing, the plant maintenance process may include a visual inspection of internal surface of the fire protection piping upon each entry to the system for routine or corrective maintenance. By performing the visual inspection on an opportunistic or focused basis on selected representative locations, and on the basis that the enhancement, when implemented, will make the Fire Water System Program consistent with the GALL Report, the staff finds the enhancement acceptable.

Based on its review, 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 enhancements.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.17 and interviewed the applicant's technical personnel to confirm that the plant-specific OE did not reveal any aging effects not bounded by the GALL Report. The staff also confirmed that applicable aging effects and industry and plant-specific OE have been reviewed by the applicant and are evaluated in the GALL Report. Furthermore, the staff confirmed that the applicant has addressed OE identified after the issuance of the GALL Report. In the "operating experience" element of LRA Section B.2.17, the LRA states that a search of condition reports was performed for the Fire Protection System. When conditions were found that required correction they were repaired in accordance with the site corrective action program. However, the applicant did not provide any specific OE related to the Fire Water System Program. The staff issued RAI B.2.17-3 requesting the applicant to provide some specific examples of issues that were found in the condition reports.

In the letter dated June 30, 2008, the applicant responded to RAI B.2.17-3 by providing several specific examples of plant OE. The applicant stated that small leaks were identified in different fire protection piping, which were repaired or the piping replaced; and ultrasonic inspection was performed on surrounding areas as part of the corrective action.

On the basis that the applicant has identified specific examples of plant OE and corrective actions taken, the staff finds the applicant response acceptable.

The staff reviewed some condition reports as part of the OE review and found that several CRs were written to address through wall leaks in fire water headers in the Circ water pumphouse area. Stagnant water in low drainage locations inside the pumphouse was determined to be the cause. The staff issued RAI B.2.17-4 requesting the applicant to address this issue, (a) to determine what changes are proposed and (b) if these locations are included in the representative sample picked for UT inspections for wall thickness measurements.

In the letter dated June 30, 2008, the applicant responded to RAI B.2.17-4 by stating that no changes were proposed to the fire water system to alleviate through wall leaks. The applicant stated that the leaks were observed in piping that is normally dry, however, stagnant water collected in low drainage locations, which made the piping system more susceptible to corrosion. The applicant further stated any leaking piping is identified to engineering for evaluation, including an operability evaluation. The applicant further stated that the Fire Water System program manages the aging by performing evaluations of issues that are identified during station activities. The applicant amended LRA Section B.2.17, Fire Water System Program, to revise the enhancement for wall thickness measurement by UT, to include representative portions of above ground piping in the dry-pipe sprinkler system, which may contain stagnant water. The applicant also revised the UFSAR Supplement and the Commitment List to include the revised enhancement.

The staff reviewed the amendment and finds that with the changes to the enhancement to include stagnant water locations in the representative sample for ultrasonic testing, the Fire Water System Program will provide further assurance that aging effects are managed and these components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Based on this review, the staff finds the applicant response acceptable.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.1.2.19, Commitment No. 46, and letters dated June 30, 2008, and October 21, 2008, the applicant provided the UFSAR supplement for the Fire Water System Program. The staff verified that the UFSAR supplement summary description for the Fire Water System Program was in conformance with the staff’s recommended UFSAR supplement for the Fire Water System Program provided in Table 3.3-2 of the SRP-LR.

The applicant committed to enhance its program to require testing or replacement of sprinkler heads in service for 50 years, and to perform ultrasonic testing of representative portions of above ground fire protection piping that are exposed to water but do not normally experience flow or are associated with a dry-pipe sprinkler system and may contain stagnant water, or is pre-action or deluge piping that is normally dry, but may have been wetted and not completely dry. The applicant also committed to enhance its program to perform within the 10-year period prior to the period of extended operation, at least one visual inspection (opportunistic or focused) of the internal surface of buried fire water piping, and at least one inspection per year of ‘wet’ fire protection piping for wall thickness and pipe blockage if no opportunistic inspection has been completed.

Based on this review, the staff finds that UFSAR supplement Section A.1.2.19 provides an acceptable UFSAR supplement summary description of the applicant’s Fire Water System Program because it is consistent with those UFSAR supplement summary description in the SRP-LR for the Fire Water System 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 the review of the applicant’s Fire Water System Program, and the applicant’s response to the staff’s RAIs, the staff finds all program elements consistent with the GALL Report. Also, the staff reviewed the enhancements and confirmed that their implementation through Commitment No. 46 prior to the period of extended operation will make the existing AMP consistent with the GALL Report AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging 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 UFSAR supplement, as amended, 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 Buried Piping and Surveillance Program

Summary of Technical Information in the Application. The LRA Section B.2.18 described the new Buried Piping Surveillance Program as consistent with GALL AMP XI.M28, “Buried Piping and Tanks Surveillance,” with an exception. This program consists of a prevention program (consisting of protective coatings and wrappings and a condition monitoring program (consisting of visual inspections). to manage the loss of material on external surfaces of piping with damaged coatings.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the

GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced GALL Report. Onsite interviews were also held to confirm these results.

In comparing the elements in the applicant's program to those in GALL AMP XI.M28, the staff noted that the program elements in the applicant's AMP claimed to be consistent with GALL were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M28 with the exception of the "scope of program" program element aspect as identified below.

The staff reviewed the exception to determine whether the AMP, with the exception will be adequate to manage the aging effects for which the LRA credits

<u>Exception:</u>

The applicant stated an exception to the "scope" program element stating that the "scope of program" element is limited to the sections of buried Residual Heat Removal Service Water (RHRSW) and Emergency Service Water (ESW) common return header piping for which damaged coatings are known to exist. Therefore, the applicant does not credit coatings in this program for aging management. All other buried piping and tanks subject to aging management are managed by the Buried Piping and Tanks Inspection Program. The staff did not agree that this is an exception to the GALL AMP because the GALL Report recommends either the use of the Buried Piping and Tanks Surveillance Program or the Buried Piping and Tanks Inspection Program for buried piping and tanks. The staff discussed this issue with the applicant and followed up with RAI B.2.18-1 in a letter dated June 13, 2008, that asked the applicant to explain why this is an exception to the GALL Report AMP. In the applicant's response to this RAI in a letter dated July 14, 2008, the applicant agreed that this should not be an exception and amended the LRA to state under "Exceptions to NUREG-1801," "None."

On the basis of the review, the staff concludes that the applicant's Buried Piping and Tanks Surveillance Program provides assurance that either the aging effect is indeed not occurring, or that the aging effect is occurring so slowly as not to affect the intended function of the component or structure. The staff finds the applicant's Buried Piping Surveillance Program acceptable because it conforms to the recommended GALL AMP XI.M28, Buried Piping and Tanks Surveillance Program following resolution of the RAI.

The staff has identified one additional area of concern that relates to the rectifiers and the ground bed anodes and all other equipment associated with the implementation of this AMP. The staff assumes that these components are not currently safety-related and are not covered by the 10 CFR Appendix B program as discussed in Appendix B.1.3 of the LRA. RAI B.2.18-2 was issued to the applicant by a letter dated June 13, 2008, and requested the applicant to clarify whether these components will remain nonsafety-related, but now fall under the 10 CFR Part 50 Appendix B program, or whether they be upgraded to safety-related. In addition, the staff asked the applicant to indicate whether the failure of one of these components will initiate a technical specification limited condition of operation and whether there will be a commitment to cover this equipment under the SSES 10 CFR Appendix B program. In its response dated July 14, 2008, the applicant responded to RAI B.2.18-2 by stating that rectifiers, ground bed anodes, and other equipment in-scope for AMP B.2.18 are nonsafety-related and that failure of these components does not result in entry into a technical specification limited condition of operation. The applicant also stated that the cathodic protection system has no safety-related function but are in-scope for license renewal under 10 CFR Part 54.4(a)(2). In the LRA Section B.1.3, the applicant states:

> "The elements of corrective actions, confirmation process, and administrative controls in the SSES QA Program will be applied to each existing, enhanced, and new aging management program and activity credited for license renewal, for both safety-related and nonsafety-related structures and components determined to require aging management during the period of extended operation."

The staff noted the systems and components used as part of the Buried Piping Surveillance Program are in-scope for 10 CFR Part 50 Appendix B. and there will be no changes to the LRA as a result of this response.

The staff requested this information for clarification and the applicant's response addressed the staff's questions and concerns. On the basis of its review, and because the applicant has included all SSCs in-scope for license renewal under its existing 10 CFR Appendix B Program regardless of safety classification, the staff finds the applicant's response acceptable.

Operating Experience. The staff also reviewed the applicant's OE, including a sample of condition reports, and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. In the application, the applicant stated that there is no OE demonstrating the effectiveness of the program because it is a new program.

The applicant stated that the Buried Piping Surveillance Program is a new program for which there is no OE and that inspection methods will be consistent with accepted industry practices. For this program and for other new AMPs where the applicant provided no current plant-specific OE, the staff issued RAI B.2.1 by letter dated June 10, 2008 asking that the applicant commit to provide documentation of plant-specific operating for staff review after the program has been implemented, but prior to entering the period of extended operation.

In its letter dated July 8, 2008, the applicant stated that OE for new aging management programs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, quality assurance program and that results will be subject to NRC review during regional inspections under existing NRC inspection modules. The applicant stated that these new programs will be implemented prior to, and continue through, the period of extended operation and that OE will be gained for these programs as they are implemented. The applicant further stated that test and inspection results that do not meet acceptance criteria for these new programs will be evaluated under the station's corrective action program, which includes requirements for identification of appropriate corrective actions and verification of the effectiveness of corrective actions.

The staff noted that the applicant's statement that inspection methods will be consistent with industry practices is consistent with the "operating experience" program element for GALL AMP XI.28. The staff also noted that post-approval site inspections provide an opportunity for staff review and assessment of the effectiveness of the applicant's Buried Piping Surveillance Program after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on internal and external plant OE, would capture OE in the future to support the conclusion that the effects of aging are adequately managed. On this basis, 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 and concludes that a separate commitment is not necessary.

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.1.2.4, Commitment No. 16, the applicant provided the UFSAR supplement for the Buried Piping Surveillance Program. The staff reviewed this section and determined that the information in the UFSAR Supplement provides an adequate summary description of the program consistent with the SRP-LR and as required by 10 CFR 54.21(d)..

Conclusion. The staff has reviewed the information provided in Section B.2.18 of the LRA Appendix B and additional information provided by the applicant by letter dated July 14, 2008. On the basis of its review as discussed above, the staff concludes that the applicant has demonstrated that effects of aging of the buried piping will be adequately managed so that the intended functions of these components 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 UFSAR supplement 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 Fuel Oil Chemistry Program

Summary of Technical Information in the Application. LRA Section B.2.20 describes the existing Fuel Oil Chemistry Program as consistent, with exceptions, with GALL AMP XI.M30, "Fuel Oil Chemistry." The applicant stated that the program is a mitigation program that manages potential aging effects for plant components in a fuel oil environment. The applicant also stated that the program manages loss of material and cracking through monitoring and control of fuel oil contamination, such as water or microbiological organisms, consistent with pertinent plant technical specifications/requirements and American Society for Testing of Materials (ASTM) standards. The applicant further stated that exposure to contaminants is minimized by verifying the quality of new fuel oil before it enters the storage tanks and by periodic sampling to ensure that the tanks are free of water and particulates.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's aging management program (AMP) evaluation report for the Fuel Oil Chemistry Program, together with implementing procedures and supporting documentation related to the program. The staff did not identify any issues requiring further resolution or clarification for elements of the program that the applicant claimed to be consistent with the corresponding program element criteria in GALL AMP XI.M30.

The applicant's Fuel Oil Chemistry Program, as described in the LRA, includes three (3) exceptions to the GALL Report identified by the applicant. These exceptions affect the "scope of program," the "parameters monitored/inspected" and "acceptance criteria," and the "monitoring and trending" program elements of the AMP. In response to an issue raised during a regional inspection of the applicant's program, the applicant identified an additional exception to the "acceptance criteria" program element and revised the LRA to identify this fourth exception. The staff reviewed the four (4) exceptions to determine whether the AMP, with exceptions, is adequate to manage the aging effects for which the LRA credits it. The staff's evaluation of the exceptions is presented in the following paragraphs.

Exception 1

LRA Section B.2.20 states an exception to the “scope of program” program element. The applicant stated that although its Fuel Oil Chemistry Program largely focuses on fuel oil tanks, the program is also applicable to other components exposed to fuel oil, including the fuel oil supply components of the diesel engine-driven fire pump. The applicant categorized expansion of the Fuel Oil Chemistry Program to include oil supply components of the diesel engine-driven fire pump as an exception to the GALL Report.

In evaluating this exception, the staff noted that in the GALL Report the “scope of program” program element for GALL AMP XI.M30 focuses exclusively on managing the aging of the interior surfaces of the diesel generator fuel oil supply tanks. The staff also noted that the material, environment and potential aging effects are identical for both the diesel generator fuel oil supply components and the diesel engine-driven fire pump fuel oil supply components and that GALL Table VII.G, item VII.G-21 credits use of the Fuel Oil Chemistry Program for aging management in the fire protection system. On the basis that the expanded scope of the applicant’s Fuel Oil Chemistry Program encompasses components with material, environment and potential aging effects identical to the components explicitly identified in the GALL Report, the staff finds the “scope of program” of the applicant’s Fuel Oil Chemistry Program, including this exception to the GALL Report, to be acceptable.

Exception 2

LRA Section B.2.20 states an exception to the “parameters monitored/inspected” and the “acceptance criteria” program elements. The applicant stated that with respect to the test described in ASTM Standard D2276-00, “Standard Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling,” their program uses the 0.8 μm pore size filter called out in the ASTM standard, rather than the 3.0 μm pore size filter recommended in the GALL Report’s description for this program element.

The applicant categorized the use a filter pore size different from what is recommended in the GALL Report as an exception to the “parameters monitored/ inspected” and the “acceptance criteria” program elements as described in the GALL Report.

The staff reviewed ASTM Standard D2276-00 and noted that the standard provides a method for gravimetric measurement of particulate matter in diesel fuel by comparing the weight of a test filter on which particulate matter is collected against the weight of a control filter through which the filtered fuel is subsequently passed, then converting the measurements to milligrams of particulate per liter of filtered fuel. The standard states that tolerable levels of particulate contaminants have not yet been established for all points in fuel distribution systems. Since specific levels of particulate are not specified by the standard, the primary purpose of the test is to ensure that particulate contamination is not increasing outside its normal operating range. The staff noted that use of a filter with different pore size from what is recommended in the GALL Report does not invalidate the test procedure, and that the applicant’s use of a filter with smaller pore size than what is recommended in the GALL Report provides a conservative measurement of particulate concentration relative to the methodology recommended in the GALL Report. Because the test methodology remains valid with the smaller pore filter and the measurements with the smaller pore filter are conservative relative to the GALL Report’s recommendation, the staff finds the “parameters monitored/inspected” and the “acceptance criteria” elements of the applicant’s Fuel Oil Chemistry Program to be acceptable.

Exception 3

LRA Section B.2.20 states an exception to the “monitoring and trending” program element. The applicant stated that an annual frequency for sampling of fuel for biological activity is used, along with monthly or quarterly sampling for other contaminants. This is an exception to the GALL Report’s recommendation that water and biological activity or particulate contamination concentrations be monitored and trended in accordance with the plant’s technical specifications or at least quarterly.

The staff reviewed the applicant’s technical specifications and technical requirements manual and noted that sampling is specified to be done in accordance with industry standards, but no specific frequency of sampling for biological activity is identified in those documents. The staff issued RAI B.2.20-1 by letter dated June 23, 2008, asking the applicant what ASTM standard is used to establish frequency for monitoring fuel oil for biological activity and to provide a basis and technical justification for its current sampling frequency if no such standard exists or is used.

The applicant responded in a letter dated July 17, 2008. In that letter the applicant provided the following discussion in response to RAI B.2.20-1:

> The schedule for sampling the emergency diesel generator fuel oil in the fuel oil storage tanks for biological activity was changed from annually to quarterly in 2007. No ASTM standard was identified since the sampling frequency now matches the frequency recommended by GALL. The exception to monitoring and trending is no longer needed and is deleted.
>
> The following changes are made to the LRA to delete the monitoring and trending exception for the Fuel Oil Chemistry Program.
>
> The third bullet under the Exceptions to NUREG-1801, in Section B.2.20 (LRA Page B-65) is revised by deletion [in its entirety].

On the basis that the applicant revised the fuel oil sampling frequency for biological activity to be consistent with the recommendations in the GALL Report and revised the LRA to delete the previously identified exception, the staff finds the “monitoring and trending” program element of the applicant’s Fuel Oil Chemistry Program to be acceptable.

Exception 4

In a letter dated October 21, 2008, the applicant identified an additional exception to the “detection of aging effects” program element. The applicant stated that ultrasonic (UT) thickness measurements are not taken on the bottoms of the diesel generator fuel oil storage tanks because the fuel oil storage tanks are buried and inaccessible; also internal surfaces are coated, and coatings would have to be removed in order to perform UT examinations. The applicant stated that UT examinations of diesel generator fuel oil day tank bottoms will be conducted as part of the Chemistry Program Effectiveness Inspection. The applicant also made changes to LRA Section B.2.22, Chemistry Program Effectiveness Inspection, to state that the bottom of at least two diesel generator fuel oil day tanks will be examined by UT measurements as part of the Chemistry Program Effectiveness Inspection AMP.

In the GALL Report the “detection of aging effects” program element states that degradation of the diesel fuel oil tank cannot occur without exposure of the tank internal surfaces to contaminants such as water and microbiological organisms. The program element also states that an ultrasonic thickness measurement of the tank bottom surfaces ensures that significant degradation is not occurring.

The staff noted that both the diesel generator fuel oil storage tanks and the diesel generator fuel oil day tanks are made of carbon steel and are exposed to an interior environment of fuel oil. The staff noted that the interior surface of the storage tanks are provided with a protective coating, but the coating is not credited in the LRA for aging mitigation; and the interior surfaces of the day tanks are not coated. The staff also noted that both the fuel oil storage tanks and the day tanks are designed so that the interior of the tanks can be visually inspected. The interior of the fuel oil storage tanks is required by Technical Specifications to be cleaned every ten years, and during the cleaning the surface condition of the tank interior is visually examined. The staff noted that except for some additional straining and filtering as fuel oil is pumped from the storage tanks to the day tanks, the interior environments of the storage tanks and the day tanks are identical; and because both tanks are made of carbon steel, aging effects in the storage tanks and the day tanks would be similar. Because aging effects in the day tanks and in the storage tanks are similar, the staff concluded that one-time UT of the bottoms of the day tanks will provide a reasonable indication of whether wall thinning may be occurring in the storage tank bottoms. In addition, the requirement for cleaning of the storage tanks every ten (10) years and visual inspection of the interior of the storage tanks provides opportunity to detect any degradation in the protective coating that would be an indication of potential degradation in the storage tank steel bottoms. Because degradation of the steel storage tank bottoms would be detected before failure of its intended function could occur, the staff concludes that UT examination of the day tank bottoms provides an acceptable alternative to UT examination of the storage tank bottoms and that Exception 4 to the “detection of aging effects” program element is acceptable.

Based on its review of the exceptions, and resolution of the related RAIs as described above, the staff finds the Fuel Oil Chemistry Program consistent with program elements of GALL AMP XI.M30, with acceptable exceptions, and therefore acceptable.

Operating Experience. The staff reviewed the applicant’s OE described in LRA Section B.2.20. The applicant stated that review of plant-specific OE did not reveal a loss of component function or fouling of subject components that contain fuel oil which could be attributed to an inadequacy of the Fuel Oil Chemistry Program. The applicant also stated that fuel oil delivered to the site is sampled and analyzed prior to addition to fuel oil storage tanks and periodically thereafter and that water and sediment is removed, particulates are filtered, and biological activity is controlled.

During the onsite audit, the staff reviewed the applicant’s “operating experience” program element for the Fuel Oil Chemistry Program. The staff reviewed selected procedures and completed work packages related to periodic fuel oil chemistry testing and preventive maintenance on components in the fuel oil storage system. The staff noted that the onsite documentation supports the applicant’s statements with regard to OE for the Fuel Oil Chemistry Program and that the applicant’s OE does not reveal any age related degradation not bounded by industry experience.

Based on this review, the staff finds that (1) the OE for this AMP demonstrates that the applicant’s Fuel Oil Chemistry Program is achieving its objective of maintaining fuel oil quality and mitigating potential corrosion of components exposed to fuel oil, and (2) that the applicant is taking appropriate corrective actions through implementation 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.1.2.21, Commitment No. 47, the applicant provided the UFSAR supplement for the Fuel Oil Chemistry Program. The staff noted that the UFSAR supplement’s description for the Fuel Oil Chemistry Program conforms with the recommended UFSAR supplement for this type of program as described in SRP-LR (NUREG-1800, Revision 1). The staff also noted that in Commitment No. 47 of LRA Table A-1, License Renewal Commitments, the applicant committed to ongoing implementation of the Fuel Oil Chemistry Program for aging management of applicable components during the period of extended operation.

Based on this review, the staff finds that the UFSAR supplement summary in LRA Section A.1.2.21 provides an acceptable description of the applicant’s Fuel Oil Chemistry Program because it is consistent with the UFSAR supplement summary description in the SRP-LR for the Fuel Oil Chemistry 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 the review of the applicant’s Fuel Oil Chemistry Program, including the LRA changes provided in response to RAI B.2.20-1, 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 exceptions and their justifications and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which the LRA credits it. 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 Reactor Vessel Surveillance Program

Summary of Technical Information in the Application. LRA Section B.2.21 describes the existing Reactor Vessel Surveillance Program as consistent, with exception, with GALL AMP XI.M31, “Reactor Vessel Surveillance.”

The Reactor Vessel Surveillance Program, which manages reduction of fracture toughness for the low-alloy steel RV shell and welds in the beltline region, is a condition-monitoring program developed in response to 10 CFR Part 50 Appendix H, “Reactor Vessel Material Surveillance Program Requirements,” and part of the Integrated Surveillance Program (ISP) described in BWRVIP-78, “BWR Integrated Surveillance Program Plan,” BWRVIP-86-A, “BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation,” and BWRVIP-116, “BWR Vessel And Internals Project, Integrated Surveillance Program Implementation For License Renewal.” BWRVIP-116 extends the ISP to cover the period of extended operation. The applicant will follow BWRVIP ISP requirements and apply ISP data to Susquehanna, Units 1 and 2. The staff approved the use of the BWRVIP ISP in place of a plant-specific program.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remained adequate to manage the aging effects for which it is credited.

In LRA Appendix B, AMP B.2.21, the applicant described its AMP to manage irradiation embrittlement of the reactor pressure vessel (RPV) through testing that monitors RPV beltline material properties. The LRA stated that the RPV surveillance program will follow the requirements of the BWRVIP ISP and will apply the ISP data to the Susquehanna units.

10 CFR Part 50, Appendix H requires that an ISP, which is 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 SSES units will comply with the requirements of 10 CFR Part 50, Appendix H.

The applicant has implemented the BWRVIP ISP based on the BWRVIP-78 report and the BWRVIP-86-A report. These reports are consistent with the GALL AMP XI.M31 for the period of the current licenses. The staff concluded that the BWRVIP ISP in BWRVIP-78 and the 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 for determining surveillance capsule and RPV neutron fluences. The staff's acceptance of the BWRVIP ISP for the current term at SSES is documented in the staff's safety evaluation report (SER) dated February 6, 2003, which is addressed in SSES License Amendment 208.

In addition, the BWRVIP developed an updated version of the ISP in the BWRVIP-116 report, which 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 BWRVIP ISP identifies capsules that must be tested to monitor neutron radiation embrittlement for all licensees participating in the ISP and identifies capsules that are available on a "contingency" basis (deferred capsules). However, no guidance is provided in the BWRVIP-116 for continued use, storage, or testing of deferred capsules. Table 3-3 of the BWRVIP-116 report indicates that both SSES units have deferred capsules.

The applicant stated in LRA AMP B.2.21, and in the UFSAR supplement Section A.1.2.41, "Reactor Vessel Surveillance Program," that the Reactor Vessel Surveillance Program is part of the ISP described in BWRVIP-78, BWRVIP-86-A, and BWRVIP-116 and it will follow the requirements of the BWRVIP ISP. BWRVIP-116-A has not been issued yet. Therefore, following the requirements of the BWRVIP ISP, as stated in LRA AMP B.2.21, may not obligate the applicant to address the additional requirements in the SER on BWRVIP-116 dated March 1, 2006. Hence, the staff issued RAI B.2.21-1, requesting that the applicant make a commitment to address these additional requirements.

By letter dated October 18, 2007, the applicant stated in its response to RAI B.2.21-1 that it would update AMP B.2.21 and UFSAR Section A.1.2.41 to include the commitment to address the additional requirements that are specified in the March 1, 2006, SER. Hence, RAI B.2.21-1 is resolved.

Exception

LRA B.2.21 characterized the Susquehanna RPV surveillance program as consistent with NUREG-1801, Section XI.M31, “Reactor Vessel Surveillance,” with an exception from the NUREG-1801 guideline which requires that analyzed capsules be stored once the analysis is complete. The staff does not accept this exception because analyzed specimens may be reconstituted for future use during or beyond the current requested extended period of operation. Hence, the staff issued RAI B.2.21-2, requesting the applicant remove this exception to NUREG-1801. Further, since the BWRVIP-116 did not provide guidelines for storage of deferred capsules, RAI B.2.21-2 also requested the applicant commit to the following:

> If the SSES 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.

By letter dated October 18, 2007, the applicant made appropriate revisions to LRA AMP B.2.21, LRA UFSAR Section A.1.2.41, and LRA Table A-1, Commitment No. 18, to reflect the elimination of the NUREG-1801 exception and the inclusion of the commitment cited above. Hence, RAI B.2.21-2 is resolved.

On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging due to loss of fracture toughness of the RPV beltline region will be adequately managed by the SSES Reactor Vessel Surveillance Program, so that the intended functions will be maintained consistent with the current licensing basis (CLB) for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Operating Experience. LRA Section B.2.21 states that there have been capsule evaluations on Susquehanna, Units 1 and 2 prior to the BWRVIP ISP. Measured decreases in upper shelf energy were consistently less than RG 1.99 projections. Measured Unit 1 RT_{NDT} increases were slightly greater, within one standard deviation, than the RG 1.99 projections while measured Unit 2 RT_{NDT} increases were less.

The staff confirmed that the above description of the OE regarding SSES’s evaluation of its surveillance data from the Reactor Vessel Surveillance Program is correct. The fact that the measured decreases in USE were consistently less than RG 1.99 projections and measured RT_{NDT} increases were within one standard deviation of the RG 1.99 projections indicated that SSES’s surveillance data testing results are consistent with industry OE.

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.1.2.41, Commitment No. 18, the applicant provided the UFSAR supplement for the Reactor Vessel Surveillance Program. The staff reviewed this section and determines that the information in the revised UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of the audit and review of the applicant’s Reactor Vessel Surveillance Program, the staff determines that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. 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 Buried Piping and Tanks Inspection

Summary of Technical Information in the Application. LRA Section B.2.30 describes the new Buried Piping and Tanks Inspection Program as consistent with GALL AMP XI.M34, “Buried Piping and Tanks Inspection,” with exceptions. This program is used to manage external corrosion of buried piping and tanks by use of external coating where appropriated combined with visual inspections of the external surfaces. The applicant stated that for tank bottoms, there will be a one-time inspection to ensure that corrosion of the tank bottom is not occurring by contact with soil.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff also confirmed that the plant program contains all of the elements of the referenced the GALL Report program. Onsite interviews were also held to confirm these results.

The staff reviewed the exceptions to determine whether the AMP, with the exceptions, will be adequate to manage the aging effects for which the LRA credits it .

Exception1

The applicant stated an exception to the “scope” program element, stating, in addition to steel (which includes cast iron) piping components and steel tanks, the scope of program includes stainless steel piping components. The GALL AMP only considers steel piping and will be updated to include additional materials in the next revision of GALL. Recent LRA reviews have shown that additional materials should be included in this AMP such as stainless steel, AL6XN specialty steel, titanium alloys, aluminum alloys, and copper alloys. The staff noted that the based on the applicant’s plant-specific operating experience that uncoated stainless steel buried piping has not experienced degradation. However the applicant has conservatively added the buried stainless steel piping with-in the scope of this program to ensure that degradation has not occurred. The staff noted that a visual inspection that will be performed by applicant on the buried stainless steel piping with in 10-years of entering the period of extended operation will be capable of detecting age-related degradation as a result of loss of material, consistent with the GALL recommendations. The American Water Works Association standard for stainless steel piping is AWWA C220, “Stainless Steel Piping.” On the basis of its review, the staff finds the applicant has conservatively included stainless steel piping in the scope of this program to be inspected with in 10 years of entering the period of extended operation and that a visual inspection of the external surface will be capable of detecting loss of material, and therefore this exception is acceptable.

The applicant stated an exception to the “preventive actions” program element, stating the buried fire protection piping components and the buried stainless steel piping components in the Condensate Transfer and Storage System are not provided with any special coatings or wrappings in accordance with plant design specifications and consistent with plant operating experience. The applicant stated in the LRA that buried piping in the Fire Protection System is constructed using cast iron and ductile iron. It is not coated per the plant design specifications. However the staff did not agree with the applicant for not coating this buried pipe, and has issued RAI B.2.30-1 in a letter dated June 13, 2008, to investigate this staff concern. The

RAI B.2.30-1 stated that the GALL Report has certain requirements for coating buried piping and questioned the applicant's decision not to coat the cast iron and ductile iron fire protection piping. By a letter dated July 14, 2008, the applicant responded to this RAI stating that the National Fire Protection Association guidance in NFPA-24 only requires protective coatings of ductile iron or cast iron piping when the piping is buried in aggressive soil. The applicant claimed that the soil at SSES is non-aggressive (Chlorides less than 500 ppm, Sulfates less than 1500 ppm, and pH greater than 5.5). The staff does not agree with this response because the definition for non-aggressive in the applicant's response is for steel reinforcing bar in sub surface concrete and is not applicable to buried ductile iron or cast iron piping. In a letter dated November 17, 2008, the applicant revised the response to RAI B.2.30-1. In the revised response, the applicant agreed to conduct an opportunistic inspection of the buried stainless steel and cast iron buried piping prior to entering the period of extended operation. Because this will confirm that there is no loss of material for stainless steel and carbon steel piping, or if loss of material is identified, the applicant will initiate corrective action, the staff finds that this is acceptable.

Exception 2

LRA Section 3.3.4.1.13 states that the Fire Protection System piping will be inspected as part of the Selective Leaching Inspection Program. However, the applicant's Buried Piping and Tanks Inspection Program did not mention this. Therefore, the staff issued RAI B.2.30-2 in a letter dated June 13, 2008, to follow up on this issue. In the applicant's response to the RAI in the letter dated July 14, 2008, the applicant amended the Buried Piping and Tanks Inspection Program to clarify that loss of material due to selective leaching for buried cast iron components is managed by the Selective Leaching Inspection Program. This amendment satisfactorily addresses the staff's concern, and this item is closed.

By letter dated June 13, 2008, the staff asked the applicant if there was any uncoated carbon steel piping in the fire protection system. By letter dated July 14, 2008, the applicant responded that there is no uncoated carbon steel piping in the fire protection system. The staff finds that because there is no uncoated carbon steel piping in the fire protection system, this issue is resolved.

The staff reviewed those portions of the applicants Buried Piping and Tanks Inspection Program that the applicant claimed consistency with GALL AMP XI.M34 and found they are consistent with this GALL AMP. On the basis of the review, the staff concludes that the applicant's Buried Piping and Tanks Inspection Program provides assurance that either the aging effect is indeed not occurring, or that the aging effect is occurring very slowly as not to affect the intended function of the component or structure. The staff finds the applicant's Buried Piping and Tanks Inspection Program acceptable because it conforms to the recommended GALL AMP XI.M34, Buried Piping and Tanks Inspection Program consistent with program elements of GALL AMP XI.M34, with acceptable exceptions, and therefore acceptable

<u>Operating Experience</u>. The staff reviewed the applicant's OE described in LRA Section B.2.30. Additionally, the staff reviewed a sample of condition reports, 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. In the application, the applicant stated that there is no operating experience with the effectiveness of the program because it is a new program.

The applicant stated that the Buried Piping and Tanks Inspection is a new program for which there is no operating experience and that inspection methods will be consistent with accepted industry practices. For this program and for other new AMPs where the applicant provided no current plant-specific operating experience, the staff issued RAI B.2.1 asking that the applicant commit to provide documentation of plant-specific operating for staff review after the program has been implemented, but prior to entering the period of extended operation.

In its letter dated July 8, 2008, the applicant stated that operating experience for new aging management programs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR 50, Appendix B, Quality Assurance program and that results will be subject to NRC review during regional inspections under existing NRC inspection modules. The applicant stated that these new programs will be implemented prior to, and continue through, the period of extended operation and that operating experience will be gained for these programs as they are implemented. The applicant further stated that test and inspection results that do not meet acceptance criteria for these new programs will be evaluated under the station's corrective action program, which includes requirements for identification of appropriate corrective actions and verification of the effectiveness of corrective actions.

The staff noted that the applicant’s statement that inspection methods will be consistent with industry practices is consistent with the “operating experience” program element for GALL AMP XI.M34. The staff also noted that post-approval site inspections provide an opportunity for staff review and assessment of the effectiveness of the applicant’s Buried Piping and Tanks Inspection Program after the applicant has developed operating experience with that program. The staff concludes that the corrective action program, based on internal and external plant operating experience, would capture operating experience in the future to support the conclusion that the effects of aging are adequately managed. On this basis, 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 and concludes that a separate commitment is not necessary.

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.1.8, Commitment No. 26, the applicant provided the UFSAR Supplement for the Buried Piping and Tanks Inspection Program. The staff reviewed this section and determined that the information in the UFSAR Supplement does provide an adequate summary description of the program consistent with the SRP-LR. The UFSAR Supplement does cite the commitment (Commitment No. 26) to implement the program, and it does mention that the program must be implemented prior to the period of extended operation.

By letter dated June 13, 2008, the staff issued RAIs on the need to coat ductile iron and cast iron piping, the need to mention that ductile iron and cast iron piping are included in the Selective Leaching Inspection Program, and whether or not there is any uncoated carbon steel piping in the fire protection system. By letters dated July 14, 2008 and November 17, 2008, the applicant provided responses to these RAIs that the staff finds to be acceptable.

The staff determines that the UFSAR supplement for this AMP provides an adequate summary description of the program, as described by 10 CFR 54.21(d).

Conclusion. On the basis of the review of the applicant's Buried Piping and Tanks Inspection Program the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which the LRA credits it. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions of these components 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, pending resolution of the open item, as required by 10 CFR 54.21(d).

3.0.3.2.14 System Walkdown Program

Summary of Technical Information in the Application. LRA Section B.2.32 describes the existing System Walkdown Program as consistent with GALL AMP XI.M36 "External Surfaces Monitoring" with enhancements to the program elements, "scope of program" and "detection of aging effects."

The applicant's program is a condition monitoring program that manages for aging effects of external surfaces and in some cases, internal surfaces, by observations and surveillance activities for mechanical components in the scope of license renewal. The applicant states that the System Walkdown Program will manage loss of material for metals in indoor/outdoor air and ventilation environments and cracking and/or change in material properties for elastomers and polymers exposed to indoor air or ventilation environments.

By letter dated August 12, 2008, October 21, 2008 and November 11, 2008 the applicant amended its LRA to include additional enhancements and exceptions to the AMP B.2.32, Systems Walkdown Program.

Staff Evaluation. During the review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and enhancements to determine whether the AMP, with the exceptions and enhancements is adequate to manage the aging effects for which the LRA credits it. The staff's summary of its onsite review of AMP B.2.32, System Walkdown Program, is documented in the staff's audit report.

In comparing the seven (7) programs elements in the applicant's program to those in GALL AMP XI.M36, the staff noted that the program elements in the applicant's AMP claimed to be consistent with GALL were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M36 with the exception of three (3) program elements: scope of program, detection of aging effects and OE, that the staff felt there was a need for additional clarification and for which RAIs were issued. The "operating experience" program element is discussed separately below.

The applicant states in LRA Section B.2.32 that this AMP will be credited to manage cracking and/or change in material properties for elastomers and polymers that are exposed to indoor air and ventilation. The staff noted that GALL AMP XI.M36 "External Surfaces Monitoring" is only applicable for steel components for loss of material and leakage. Therefore, by letter dated July 10, 2008 the staff issued RAI B.2.32-4 requesting the applicant to justify the basis for crediting the System Walkdown Program to manage cracking and changes to material properties for elastomer and polymer components. The applicant responded to RAI B.2.32-4 by letter dated August 12, 2008. In its response, the applicant amended the LRA to include exceptions and enhancements that were not previously identified in the LRA to address RAI B.2.32-4. The staff determined that the applicant has addressed RAI B.2.32-4..

In AMP B.2.19 the applicant states that paints, coatings, sealants and caulking will be monitored under the Systems Walkdown Program. Upon the staff's review of LRA section B.2.32 and associated plant basis documents, the staff noted that these materials were not included into the scope of program for B.2.32. Therefore by letter dated July 10, 2008, the staff issued RAI B.2.32-3 requesting the applicant clarify whether paints, coatings, sealants and caulking are within the scope of AMP B.2.32 and if so, to clarify the inspection techniques that will be credited to monitor for applicable aging effects. The applicant responded to RAI B.2.32-3, by letter dated August 12, 2008. In its response letter the applicant stated that paints, coatings, sealants and caulking are not credited for preventing or mitigating the effects of aging and do not perform an intended function as part of license renewal. The staff noted that since the applicant does not credit these design features for aging management they are not required to manage the aging effects that may affect paints, coating, sealants and caulking as part of license renewal. However the applicant referred to its response to RAI B.2.19-1, which stated that structural sealants and caulking are inspected as part of the Structural Monitoring Program. The staff confirmed that sealants and caulking are inspected by the Structural Monitoring Program for the Condensate and Refueling Water Storage Tanks. The staff noted that visual inspections of the condition of paints and coatings on the external surfaces of the Condensate and Refueling Water Storage Tanks will be a sign if degradation and corrosion maybe occurring on the underlying material, but paints and coatings are not credited. Based on its review, the staff finds the applicant's response acceptable because (1) the applicant has not credited paints and coatings with preventing and mitigating aging of the underlying materials, and therefore does not require aging management (2) the applicant will perform periodic visual inspections of the external surfaces of the tanks, including paints and coatings, to determine the condition of the underlying metallic material (3) the staff confirmed that sealants and caulking are inspected and monitored by the Structures Monitoring Program.

<u>Exception</u>

The applicant responded to RAI B.2.32-4, by letter dated August 12, 2008. In its response the applicant amended the LRA Section B.2.32 to include an exception to GALL AMP XI.M36. This exception was in regard to the addition of elastomer and polymer components to the scope of the applicant's program. During its review the staff also noted that the applicant had included stainless steel, copper alloy and aluminized steel into the scope of its program; however, GALL AMP XI.M36 only recommends this program perform visual inspections on carbon steel components. Therefore by letter dated October 17, 2008 the staff issued RAI B.2.32-5 requesting the applicant to justify why the expansion in-scope of materials was not considered an enhancement and to justify the basis for expanding the scope of materials. Also, by letter dated October 17, 2008 the staff issued RAI B.2.32-4R requesting the applicant to clarify why the exception above was not identified as an enhancement to the GALL AMP XI.M36. By letter dated November 11, 2008 the applicant responded to RAI B.2.32-5 by stating that the expansion in the scope of metallic materials will be considered an exception and enhancement to GALL AMP XI.M36. The following exception was based on the applicant's response to the staff's RAI B.2.32-4 and B.2.32-5:

Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending –

Elastomers and polymers are included within the scope of the Systems Walkdown Program. The program is credited with managing cracking and change in material properties for elastomers and polymers exposed to indoor air or ventilation environments.

Copper alloy and stainless steel are included within the scope of the System Walkdown Program. The program is credited with managing loss of material for copper alloy and stainless steel exposed to indoor air, outdoor air or ventilation environments.

The applicant responded to RAI B.2.32-4R and RAI B.2.32-5, by letter dated November 11, 2008. In its response to RAI B.2.32-4R the applicant stated that the expansion in the scope of materials for this program is considered an exception and enhancement. The staff's evaluation of this exception and enhancement were performed separately and are documented in this section of the SER. The staff noted that the applicant has committed, by Commitment No. 28 as amended by letter dated November 11, 2008, to enhance its program prior to the period of extended operation to generate a routine activity to supplement the current existing plant program to include a supplemental physical manipulation and/or prodding to inspect elastomer and polymer components. The applicant stated in response to RAI B.2.32-4R that evidence of chalking, cracking, crazing, discoloration and any physical distortion has occurring. The staff noted that for the supplemental physical manipulation the applicant will identify hardening, lack of resiliency, surface film or residue and unusual odors. The staff further noted that any signs of the degradation identified by the visual inspection or physical manipulation will be evaluated. The staff noted that the physical manipulation will aid the visual inspection in detecting age-related degradation because changes in material properties and cracking can be detected during manipulation of elastomeric and polymeric components by the relative inflexibility of the component, or by the failure of the component to return to its previous shape or configuration. On the basis of its review, the staff finds that the applicant will be capable of managing the effects of aging for elastomers and polymers because the applicant (1) is crediting a visual examination of elastomer and polymers and an inspection technique that includes physical manipulation and/prodding of the components, which are capable of detecting the aging effects of cracking and/or change in material properties and (2) any signs of degradation will be evaluated by the applicant and addressed as part of their corrective actions program.

In its response to RAI B.2.32-5 the applicant stated that for the aging effect and aging mechanisms of concern, which include loss of material due to pitting, crevice and galvanic corrosion, for copper alloy and stainless steel are similar to carbon steel, such that a visual inspection will be effective in identifying loss of material. The applicant stated that aluminized steel is considered to be equivalent to steel because the aluminum coating is not credited. The staff determined that since the applicant does not credit the aluminum coating, aluminized steel is equivalent to steel and does not need to be includes in the expansion in the scope of materials. The staff noted that metallic components, including copper alloy and stainless steel, would exhibit indications of loss of material on the surface similar to steel and a visual inspection will be capable of detecting age related degradation. The applicant further stated that the parameters monitored by the visual inspection will include: corrosion, wastage of material, leakage to and from external surfaces, worn/flaking/oxide-coated surfaces, corrosion stains and coating degradation. Furthermore, any signs of degradation that is present will be evaluated to determine if the components are acceptable for continued operation. On the basis of its review, the staff finds the applicant's response acceptable because (1) the applicant will be performing visual inspections that are capable of detecting loss of material in metallic components as they display indications of degradation similar to steel, for which GALL AMP XI.M36 was intended and (2) any signs of degradation will evaluated.

On the basis of its review of the LRA and the applicant's responses to RAI B.2.32-4, RAI B.2.32-4R and RAI B.2.32-5, the staff finds the applicant's exception acceptable because (1) the applicant will perform visual inspections during system walkdowns that will be effective in identifying loss of material in other metallic components which exhibit indications of degradation similar to steel, (2) the applicant will supplement the visual inspection with a physical manipulation and/or prodding, which are adequate techniques to detect change in material properties and cracking in elastomers and polymers (3) and any degradation will be evaluated to ensure these metallic and non-metallic components are acceptable for continued operation.

In its response to RAI B.2.32-5 the applicant stated that for the aging effect and aging mechanisms of concern, which include loss of material due to pitting, crevice and galvanic corrosion, for copper alloy and stainless steel are similar to carbon steel, such that a visual inspection will be effective in identifying loss of material. The applicant stated that aluminized steel is considered to be equivalent to steel because the aluminum coating is not credited. The staff determined that since the applicant does not credit the aluminum coating, aluminized steel is equivalent to steel and does not need to be includes in the expansion in the scope of materials. The staff noted that metallic components, including copper alloy and stainless steel, would exhibit indications of loss of material on the surface similar to steel and a visual inspection will be capable of detecting age related degradation. The applicant further stated that the parameters monitored by the visual inspection will include: corrosion, wastage of material, leakage to and from external surfaces, worn/flaking/oxide-coated surfaces, corrosion stains and coating degradation. Furthermore, any signs of degradation that is present will be evaluated to determine if the components are acceptable for continued operation. On the basis of its review, the staff finds the applicant's response acceptable because (1) the applicant will be performing visual inspections that are capable of detecting loss of material in metallic components as they display indications of degradation similar to steel, for which GALL AMP XI.M36 was intended and (2) any signs of degradation will evaluated.

On the basis of its review, the staff finds the applicant's exception acceptable because the applicant will perform visual inspections during system walkdowns that will be effective in identifying loss of material in other metallic components which exhibit indications of degradation similar to steel and any degradation will be evaluated to ensure these components are acceptable for continued operation.

<u>Enhancement 1</u>

In LRA Section B.2.32 the applicant states that the program element "scope of program" for the System Walkdown Program must be enhanced in order to be consistent with GALL XI.M36, “External Surfaces Monitoring.” By letter dated November 11, 2008 the applicant amended the LRA to include additional information to this enhancement. The applicant’s enhancement to the scope of program is as follows:

> Scope of Program
>
> The governing procedure for the System Walkdown Program must be revised to add the listing of systems crediting the program for license renewal, and to explicitly include other metals, copper alloy and stainless steel. A routine activity to supplement the existing plant program must be generated to inspect elastomers and polymers.

In the program element “scope of program” for GALL XI.M36 “External Surfaces Monitoring”, external surfaces are to be visually inspected components within scope. The additional information in this enhancement, in regards to the additional metallic components and elastomers, is evaluated by the staff in Exception #1 and Enhancement #4 in this section of the SER. The staff reviewed LRA Section B.2.32 and finds the applicant’s enhancement acceptable because the applicant’s procedure will be updated to include all systems that have credited this program for aging management based on the recommendations of GALL XI.M36. On the basis of its review, as described above, the staff concludes that this enhancement is acceptable.

Enhancement *2*

In LRA Section B.2.32 the applicant states that the program element “detection of aging effects” for the System Walkdown Program must be enhanced in order to be consistent with GALL XI.M36. By letter dated October 21, 2008, the applicant amended its LRA based on a License Renewal Regional Inspection, and in this amendment the applicant provided additional details to this enhancement. The applicant’s enhancement to the detection of aging effects is as follows

> Detection of Aging Effects
>
> All of the systems to be added to the procedure contain mechanical components whose external surfaces require aging management during the period of extended operation. It may be determined by engineering evaluation that these components do not require monitoring every two weeks, and the basis for a different walkdown frequency may be documented on the appropriate procedure form.
>
> The governing procedure for the System Walkdown Program must be enhanced to address the license renewal requirement for opportunistic inspections of normally inaccessible components (e.g., those that are insulated), and those that are accessible only during refueling outages.
>
> For underground vaults, an initial sample of at least one vault/pit/manhole from each grouping of components with identical material and environment combinations will be inspected prior to entering the period of extended operation. A representative sample of the entire population will be inspected within the first 6 years of the period of extended operation. Results of the inspection activities that require further engineering evaluation/resolution (e.g., sample expansion and inspection frequency changes if degradation is detected), if any, will be evaluated using the corrective action process.

Based on its review, the staff determined additional information was needed to complete its review that relates to the systems that will be added to the scope of the AMP B.2.32, the current frequency of inspections, and the basis for changing the frequency. Therefore, by letter dated July 10, 2008 the staff issued RAI B.2.32-2 requesting the applicant to identify the systems that are within the scope of the AMP B.2.32 that are subject to the enhancements, to clarify the current frequency of system walkdowns for different plant systems that are within the scope of AMP B.2.32, and to provide the basis for changing the frequency of system walkdowns and clarify the process used for changing these frequencies. The applicant responded to RAI B.2.32-2, by letter dated August 12, 2008. The applicant provided a listing of the systems that would be affected by this enhancement as requested by the staff. The applicant also provided the frequency of walkdowns that are applicable to the scope of systems managed by this program. The staff noted that the frequencies being utilized by the applicant are consistent with those recommendations provided in GALL AMP XI.M36, which are walkdowns that exceed once per refueling cycle for accessible locations, for locations inaccessible during normal plant operation inspections are performed during the refueling outage, and for those locations that are inaccessible during refueling outages and normal plant operation inspections will be performed opportunistically. As stated in the “detection of aging effects” program element in the GALL Report, the inspection frequency may be adjusted as needed based on the plant-specific inspection results and industry experience. The applicant’s proposal to adjust the inspection frequency is consistent with the recommendations in the GALL Report, and is subject to an engineering evaluation, approval by engineering supervision and is subject to a 10 CFR 50.59 review to determine if prior NRC approval is required for any frequency change. The applicant’s amendment that was provided by letter dated October 21, 2008 provided details on inspections that will be performed before and after the period of extended operation on those normally inaccessible components that require opportunistic inspections, specifically samples of underground vaults. The staff noted for these normally inaccessible locations, the applicant has committed to inspect an initial sample before the period of extended operation and again within 6 years after the start of the period of extended operation. The staff further noted that the applicant’s approach is conservative because it requires the inspection at least within 6 years after entering the period extended operation compared to an opportunistic inspection that may potentially exceed 6 years. Based on its review, the staff finds the applicant’s response and enhancement acceptable because (1) the applicant’s inspection frequency is consistent with the recommendations provided in GALL AMP XI.M36 (2) the applicant’s ability to change the inspection frequency of walkdowns is subject to a 10 CFR 50.59 review and (3) for underground vaults the applicant’s commitment to perform inspections in a specified time frame that is conservative compared to a strictly opportunistic inspection.

On the basis of its review as described above, the staff concludes the applicant’s enhancement when implemented prior to the period of extended operation is acceptable.

<u>Enhancement 3</u>

By letter dated October 21, 2008, the applicant amended the LRA to provide an additional enhancement. The applicant’s enhancement to the detection of aging effects program element is as follows:

> <u>Detection of Aging Effects</u>
>
> Also, within the 10 year period prior to the period of extended operation a visual inspection and ultrasonic inspection of external surfaces of piping passing into

structures through penetrations (underground piping) will be performed, for those penetrations with a history of leakage. These inspections will be focused on penetrations that are leaking at the time and will include a representative sample of each material, environment combination from those piping systems within the scope of license renewal (which includes those for the RHRSW, ESW, and Fire Protection systems) that enter structures below grade.

The staff noted that the applicant has committed to perform a visual inspection of external surfaces of piping passing into structures through penetrations (underground piping) and in addition the applicant will conservatively perform an ultrasonic inspection to identify degradation. Furthermore, the applicant committed to perform these inspections prior to entering the period of extended operation to ensure detection of degradation prior to component intended function being lost. The staff noted the applicant's commitment, captured in Commitment No. 28, will require inspections of these areas prior to the period of extended operation to ensure that degradation, if any, is detected and corrected by the corrective actions program prior to entering the period of extended operation. On the basis of its review, the staff finds the applicant's enhancement acceptable because (1) the applicant will be performing a visual inspection of the external surfaces of piping that enter structures below grade, which is consistent with the recommendations in GALL AMP XI.M36 and (2) the applicant will conservatively perform an ultrasonic inspection in addition to the visual inspection to assist in the detection of any degradation in those penetrations that are leaking and with a history of leakage.

On the basis of its review, as described above and the applicant's enhancements when implemented prior to the period of extended operation will make the applicant's Systems Walkdown Program consistent with the recommendations provided by GALL AMP XI.M36.

<u>Enhancement 4</u>

The applicant responded to RAI B.2.32-4, by letter dated August 12, 2008. In its response the applicant amended the LRA Section B.2.32 to include the following enhancement, and subsequently amended by letter dated November 11, 2008 to provide additional details:

<u>Parameters Monitored/Inspected</u>

A routine activity must be generated, and based at least in part on EPRI 1007933, "Aging Assessment Field Guide", to inspect elastomers and polymers for cracking and/or change in material properties. Evidence of surface degradation, such as cracking, or discoloration, as well as physical manipulation and/or prodding, will be used as measures of material condition.

The staff noted that the applicant has expanded the scope of its System Walkdown Program to include elastomer and polymer components. The staff further noted that a visual inspection alone would not have been capable of detecting aging effects such as cracking and/or change in material properties for elastomers and polymers. Based on the applicant's amendment to include this enhancement the staff noted that the applicant will not only utilize a visual inspection for evidence of degradation, noticeable cracking or discoloration, but the applicant will be supplementing the visual inspection with an appropriate physical manipulation and/or prodding of the component. However, the staff felt that additional information was needed; therefore, by letter dated October 17, 2008 the staff issued follow-up RAI B.2.32-4R Part B requesting the applicant to clarify the acceptance criteria for the supplemental physical manipulation and/or prodding of polymers and elastomers. By letter dated November 11, 2008 the applicant responded to RAI B.2.32-4R by stating that the visual inspection of the elastomers will determine if such things as chalking, cracking, crazing, discoloration and any physical distortion is occurring. The staff noted that for the supplemental physical manipulation the applicant will identify hardening, lack of resiliency, surface film or residue and unusual odors. The staff further noted that any signs of the degradation identified by the visual inspection or physical manipulation will be evaluated. The staff noted that the physical manipulation will aid the visual inspection in detecting age-related degradation because changes in material properties and cracking can be detected during manipulation of elastomeric and polymeric components by the relative inflexibility of the component, or by the failure of the component to return to its previous shape or configuration. On the basis of its review, the staff finds that the applicant will be capable of managing the effects of aging for elastomers and polymers because the applicant (1) is crediting a visual examination of elastomer and polymers and an inspection technique that includes physical manipulation and/prodding of the components, which is capable of detecting the aging effects of cracking and/or change in material properties and (2) any signs of degradation will be evaluated by the applicant and addressed as part of its corrective actions program.

On the basis of its review, the staff finds the applicant's enhancement acceptable because the applicant will perform visual inspections and a physical manipulation during system walkdowns that will be effective in identifying change in material properties and

cracking for elastomer and polymer components and any degradation will be evaluated to ensure these components are acceptable for continued operation.

Enhancement 5

The applicant responded to RAI B.2.32-4 by letter dated August 12, 2008. In its response the applicant amended the LRA Section B.2.32 to include the following enhancement, which was supplemented by a letter dated November 11, 2008 to indicate the specific routine activity:

> Detection of Aging Effects
>
> The routine activity to inspect elastomers and polymers, to include physical manipulation and/or prodding, will be based on inspection of a representative sample of components. The sample will be determined by engineering evaluation with a focus on components considered to be most susceptible to aging, such as due to their time in service, the severity of conditions during normal plant operation, and any pertinent design margins.

The staff noted that the applicant is selecting a representative sample of elastomer and polymer components. The applicant stated that this representative sample will be based on an engineering evaluation which takes into consideration which components may be more susceptible to aging. The staff further noted that such conditions as the amount of time the component has been in service, the severity of the conditions and environments that the component is exposed to during normal plant operation and other relevant design margins that may be applicable are factored in as part of the applicant's engineering evaluation to select components for the routine activity to inspect elastomers and polymers.

On the basis of its review, the staff finds that the applicant's enhancement acceptable because (1) the applicant's representative samples of elastomer and polymer components for inspection will be based on selecting those components that are more susceptible and likely to experience age-related degradation and (2) the applicant will supplement its visual inspection with a physical manipulation and/or prodding which will be capable of detecting cracking and/or change in material properties in elastomers and polymers as discussed in Enhancement #4.

Operating Experience. The staff also reviewed the applicant's OE described in the applicant's license renewal basis document for the System Walkdown Program. The staff noted during its review of the license renewal plant basis documents for this program, which the applicant reviewed its plant OE action requests and condition reports for the most recent five-year period. From the applicant's review of its database, it was revealed that leakage, damage, and degradation are routinely identified by this program. The staff noted that subsequent to identifying an issue with this program, corrective actions were taken in a timely manner, and a loss of pressure boundary integrity did not occur due to aging effects that are within the scope of this program. However, the staff felt that additional information was needed to complete its review; therefore, by letter dated July 10, 2008 the staff issued RAI B.2.32-1 requesting the applicant to identify the plant systems within the scope of this program that have had problems with age-related degradation and to also identify the specific age-related degradation that was occurring in each instance. The staff further asked the applicant to clarify if the age-related degradation has had any impact on the program's ability to manage aging and if the program will need to be augmented or enhanced to ensure adequate aging management of these systems. Finally, the staff asked the applicant to identify the corrective actions that were taken to correct these issues associated with the problems in the plant systems in the scope of this program.

The applicant responded to RAI B.2.32-1, by letter dated August 12, 2008. In this letter, the applicant stated that as part of the preparation of the LRA, a plant-specific search of Action Requests and Condition Reports was performed of the most recent 5-year period for OE. The applicant provided several examples of OE and the corrective actions that were taken in response to the action request or condition report. The staff noted that one of the examples provided by the applicant indicated the Instrument Air piping had a crack downstream of an isolation valve. The applicant took corrective actions and replaced the cracked section of pipe. Another example provided by the applicant indicated that the enamel/wrap coating that normally protects the piping for the Circulating Water System was severely degraded on the piping that extends above the ground near the base of the cooling towers. The applicant noted that the portions of the pipe that had been exposed due to the coating degradation were corroded. The staff noted that based on this discovery of the degraded coating and corroded piping the applicant initiated corrective actions to take UT measurements of the piping to ensure that there was sufficient and proper wall thickness before the piping was re-coated. As an added measure, the applicant excavated the buried portions of the corroded piping to ensure that the coating was intact and that wall thinning and corrosion was not occurring in the buried portion of this piping during the refueling outage that followed the initial discovery. Based on the staff's review of the applicant's response and the OE that was provided, the staff finds the applicant's response acceptable because the applicant's program was capable of detecting degradation bounded by industry experience and then initiated corrective actions to resolve the discovered degradation.

The staff confirmed that the "operating" experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds the program element acceptable.

UFSAR Supplement. The staff reviewed the UFSAR Supplement summary description that was provided in LRA Section A.1.2.47, Commitment No. 28, for the System Walkdown Program. The staff verified that, in LRA Commitment No. 28 of UFSAR Supplement Table A-1, the applicant committed to enhancing its program prior to the period of extended operation. By letters dated August 12, 2008, October 21, 2008 and November 11, 2008, the applicant amended the LRA include additional enhancements to AMP B.2.32. The staff confirmed the applicant amended LRA Section A.1.2.47 and Commitment No. 28 to include a brief description of these enhancements and has committed to implement these enhancements prior to the period of extended operation. The staff also verified that the applicant has placed this commitment in UFSAR Supplement summary description A.1.2.47 for the System Walkdown Program.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.47 provides an acceptable UFSAR Supplement summary description of the System Walkdown Program because it is consistent with those UFSAR Supplement summary descriptions in the SRP-LR and because the summary description includes the bases for determining that aging effects will be managed. The staff determines that the UFSAR supplement for this AMP provides an adequate summary description of the program, as described by 10 CFR 54.21(d).

Conclusion. On the basis of the audit and review of the applicant's System Walkdown Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and its justification and determines that the AMP, with the exception, is adequate to manage the aging effects for which the LRA credits it. Also, the staff reviewed the enhancements and confirmed that they will be implemented through Commitment No. 28 prior to the period of extended operation. 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 Lubricating Oil Analysis Program

Summary of Technical Information in the Application. LRA Section B.2.33 of the LRA describes the existing program, "Lubricating Oil Analysis Program." as consistent with the GALL AMP XI.M39, "Lubricating Oil Analysis Program" with enhancement and exceptions. The LRA states this program is used to mitigate damage in components exposed to lubricating oil due to loss of material and reduction of heat transfer due to fouling. The applicant stated that the program manages the aging effects through monitoring that is consistent with manufacturer's recommendations and standards for lubricating oil from the American Society for Testing of Materials (ASTM). In addition, this program is supplemented with the Lubricating Oil Inspection, a one-time inspection program to verify its effectiveness.

Staff Evaluation. The staff's summary of its onsite review of AMP B.2.33, Lubricating Oil Analysis Program, is documented in staff's audit report. For its onsite review, the staff reviewed and compared the program elements of B.2.33 Lubricating Oil Analysis Program with its corresponding elements of GALL AMP XI.M39, "Lubricating Oil Analysis Program."

In comparing the seven (7) programs elements in the applicant's program to those in GALL AMP XI.M39, the staff noted that the program elements in the applicant's AMP claimed to be consistent with the GALL Report were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M39 with the exception of those enhancements and exceptions taken by the applicant that the staff determined there was a need for additional clarification and for which RAIs were issued. The staff reviewed the exceptions and enhancement, to determine whether the AMP with the exceptions and enhancement, is adequate to manage the aging effects for which the LRA credits it. The operating experience program element is discussed separately below.

Exception

The Lubricating Oil Analysis Program includes two exceptions to the parameters monitored or inspection program element. The first exception is that the program does not perform a particle count on the Emergency Diesel Generator or Residual Heat Removal System pump motor oil samples. Instead, the applicant performs direct read ferrography as stated in LRA section B.2.33. The staff noted that direct read ferrography only measures ferrous particles whereas particle counters measures both ferrous and non-ferrous particles. Thus, aging effects due to non-ferrous particles may not be accounted for by ferrography. By letter dated July 10, 2008 the staff issued RAI B.2.33-1 in which the staff requested the applicant to justify why “direct read ferrography” is an acceptable alternative to performance of periodic particular content counting. By letter dated August 12, 2008, the applicant responded to RAI B.2.33-1, in which the applicant stated that it performs a direct read ferrography on the diesel lube oil rather than particle counting because of the way in which particle counting performs the test. The applicant explained that the particle counters utilize optical devices that pass light through the lube oil sample in order to count the particles. The staff noted that diesel lube oil is dark in color, and the use of a particle counter on dark lube oils is difficult unless the sample lube oil is diluted in order to allow more light to pass through the sample oil. The applicant stated that dilution of the sample lube oil would create concerns if the diluents contain any contamination that may skew the results from the particle counting. The staff further noted that the method of direct read ferrography primarily measures the number of ferrous particles per milliliter of fluid, which is normally due to mechanical wear of the system. The staff further noted that the applicant stated it utilizes a spectrochemical testing which is capable of measuring up to twenty-one different metals less than 10-microns in size. The staff noted that the intent of the recommendation of the GALL AMP XI.M39 to perform particle counting was to reveal abnormal wear rates or excessive corrosion. The staff finds that the applicant’s use of direct read ferrography and spectrochemical testing will be capable of revealing abnormal wear rates, excessive corrosion, and detect changing trends in wear debris and contamination. On the basis of its review, the staff finds the applicant’s response acceptable as described above.

On the basis of its review, the staff finds the applicant’s exception acceptable because with the use of direct read ferrography and spectrochemical testing on dark diesel lubricating oil the applicant will be capable of detecting abnormal wear rates, excessive corrosion and detect changing trends in wear debris and contamination, which is consistent with the intent of the particle counting test that is recommended by GALL AMP XI.M39.

Exception 2

The second exception to this program is it does not determine the flash point for the HPCI, RCIC, or RHR motor oil samples. Instead, the applicant performs direct read ferrography, viscosity, total acid number, water content and metals content as stated in LRA section B.2.33. The staff reviewed this exception and onsite documents for this program. The staff noted that the tests that will be performed in lieu of the flash point testing are acceptable alternatives that would allow the applicant to track the level of contaminants in the oil systems. The staff noted that the intent of the GALL AMP XI.M39 is to maintain the oil systems contaminants within acceptable limits, which the applicant will be capable of doing by performing a direct read ferrography, viscosity, total acid number, water content and metals content test. The staff determined that the tests the applicant will be performing are consistent with the intent of GALL AMP XI.M39 and on this basis, the staff finds this exception acceptable.

Enhancement 1

The Lubricating Oil Analysis Program includes an enhancement to the scope of the program element. The applicant stated that the program will be enhanced to sample the lubricating oil from the Control Structure Chiller when the oil is changed.

In addition, the applicant further stated that a particle count and a check for water will be performed on the drained oil from the Control Structure Chiller.

As a result of the applicant's response to RAI B.2.25-1, in a letter dated August 12, 2008, the applicant amended LRA Section B.2.33 and Commitment No. 48 so the program will be enhanced to sample the lubricating oil from the Reactor Building Chiller when the oil is changed. In addition, a particle count and a check for water will be performed on the drained oil from the Reactor Building Chiller. The staff noted that the scope of program element of GALL XI.M39 states that on a periodic basis, this program samples lubricating oil from plant components subject to aging management review. Upon review of the site documents and the LRA, the staff determines the enhancement is consistent with scope of GALL XI.M39. On this basis, the staff determines this enhancement is acceptable, for the Reactor Building Chiller and Control Structure Chiller.

Operating Experience. The staff also reviewed the operating experience described in LRA Section B.2.33. The applicant indicated that review of SSES operating experience did not reveal a loss of component intended function for components exposed to lubricating oil from inadequacy of the Lubricating Oil Analysis Program. In addition, the LRA stated that abnormal lubricating oil conditions are promptly identified, evaluated, and corrected. The staff reviewed the operating experience identified in the GALL XI.M39 and noted that it states that no instances of component failures from lubricating oil contamination have been identified as well. In addition, the staff reviewed the onsite operating experience data and condition reports and did not find any reports of component failures due to lubricating oil contamination. On this basis, the staff finds the operating experience data acceptable.

The staff confirmed that the operating experience program element satisfies the criterion defined in the GALL Report and in SRP LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.1.2.28, Commitment No. 48, the applicant provided the UFSAR Supplement summarizing the Lubricating Oil Analysis Program. The staff reviewed the section of the UFSAR Supplement and determines that it is an adequate summary description of the program, as required by 10 CFR 54.21(d).

The staff reviewed the UFSAR Supplement summary description that was provided in LRA Section A.1.2.28 for the Lubricating Oil Analysis Program. The staff noted that in its response to RAI B.2.25-1 and the associated amendments, the applicant did not amend LRA Section A.1.2.28 to include the Reactor Building Chiller. The staff confirmed that by letter dated September 26, 2008, the applicant amended LRA Section A.1.2.28 to include the Reactor

Building Chiller. The staff verified that, in LRA Commitment No. 48 of UFSAR Supplement Table A-1, the applicant includes a brief description of the enhancement and committed to enhancing the program to include sampling from the Reactor Building Chiller and the Control Structure Chiller and have the lubricating oils tested for water and for particle count and implementing these enhancements prior to the period of extended operation. The staff also verified that the applicant has placed this commitment on UFSAR Supplement summary description A.1.2.28 for the Lubricating Oil Analysis Program.

Based on this review, the staff finds that UFSAR Supplement Section A.1.2.28 provides an acceptable UFSAR Supplement summary description of the Lubricating Oil Analysis Program because it is consistent with those UFSAR Supplement summary descriptions in the SRP-LR and because the summary description includes the bases for determining that aging effects will be manage. Therefore, the staff concludes that the UFSAR supplement for this AMP 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 Lubricating Oil Analysis Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which the LRA credits it. The staff reviewed the enhancement and confirmed that its implementation through Commitment No. 48 prior to the period of extended operation would make the existing AMP consistent with the GALL Report AMP to which it was compared. In addition, the staff reviewed the applicant's responses to the staff's RAI and its evaluation is documented above. 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 Masonry Wall Program

Summary of Technical Information in the Application. LRA Section B.2.38 describes the existing Masonry Wall Program as consistent, with an enhancement, with the GALL AMP XI.S5, "Masonry Wall Program." This program will manage aging effects so that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operations.

The applicant stated that the program includes all masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Included components are the 10 CFR 50.48 required masonry walls, radiation shielding masonry walls, and masonry walls with the potential to affect safety-related components.

The applicant further stated that the Masonry Wall Program is implemented as part of the Structures Monitoring Program. Masonry walls are visually examined at a frequency selected to ensure there is no loss of intended function between inspections.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, is adequate to manage the aging effects for which it is credited in the LRA.

The staff interviewed the applicant's technical staff and reviewed the associated bases documents for the AMP B.2.38 "Masonry Wall Program," which provides an assessment of the AMP elements' 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 (Masonry Wall Design, U.S. Nuclear Regulatory Commission, May 8, 1980) and Information Notice 87-67 (Lesson Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11, U.S. Nuclear Regulatory Commission, December 31, 1987), During the audit and review, the staff asked the applicant for the visual examination frequency for the program and its technical basis. In its response, the applicant stated that the inspection is implemented by the Structures Monitoring Program and consists of visual inspection for cracking in joints, deterioration of penetrations, missing or broken blocks, missing mortar, and general mechanical soundness of steel supports. The applicant also stated that visual inspections are conducted at least every five years to ensure no loss of intended function between inspections. Based upon its review, the staff finds the applicant's Masonry Wall Program, with the enhancement (Commitment No. 33) as described below, consistent with the program elements of GALL AMP XI.S5, "Masonry Wall Program," and therefore acceptable

The staff reviewed the enhancement to determine whether the AMP, with the enhancement, is adequate to manage the aging effects for which it is credited in the LRA.

Enhancement

LRA Section B.2.38 states an enhancement to the "acceptance criteria" program element of the Structures Monitoring Program procedure to specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing are evaluated to ensure that the current evaluation basis is still valid.

The staff reviewed the applicant's Masonry Wall Program, the Structures Monitoring Program, and their AERMs under the acceptance criteria program element of the Structures Monitoring Program. The staff noted that visual examination of masonry walls is performed to identify indications of cracking resulting from overstress due to applied loads, shrinkage, temperature effects, or differential movement. Potential design non-conforming conditions identified during the course of an inspection are noted and a condition report is initiated. Corrective actions are taken if the extent of cracking and steel degradation is sufficient to invalidate the evaluation basis.

The responsible engineer identifies problems with structural performance, initiates structural deficiency reports, and recommends corrective action. Acceptance criteria are established such that corrective actions are initiated prior to loss of function. The staff found this enhancement acceptable because when the enhancement is implemented, AMP B.2.38, "Masonry Wall Program," will be consistent with the GALL AMP XI.S5 and provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.38, and “Operation Experience Review Report (Masonry Wall’s section)”, and interviewed the applicant’s technical staff to confirm that the plant-specific OE has been reviewed by the applicant and was evaluated as intended in the GALL Report. During its audit, the staff found some minor indications that did not affect the structural integrity of any of the structures reviewed. Furthermore, the staff confirmed that the applicant had addressed OE identified after the issuance of the GALL Report. The staff finds that the applicant’s Masonry Wall Program, with the corrective actions and enhancements discussed in the LRA, has been effective in identifying, monitoring, and correcting the aging effects of masonry walls. The staff also confirmed that plant-specific OE did not reveal any degradation not bounded by industry experience.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.1.2.31, Commitment No. 33, “Masonry Wall Program,” the applicant provided the UFSAR supplement for the Masonry Wall Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant’s Masonry Wall Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the enhancement and confirmed that its implementation through Commitment No. 33 prior to the period of extended operation would make the existing AMP consistent with the GALL Report AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 Structures Monitoring Program

Summary of Technical Information in the Application. LRA Section B.2.39 describes the existing Structures Monitoring Program as consistent, with enhancements, with GALL AMP XI.S6, “Structures Monitoring Program.” In the LRA, the applicant stated that the program will manage aging effects such that loss of material, cracking, change of material properties, and loss of form are detected by visual inspection prior to the loss of the structure’s or component’s intended function(s). The applicant also stated that the program also implements the Masonry Wall Program and the RG 1,127 Water Control Structures Inspection.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancements (Commitment No. 34) to determine whether the AMP, with the enhancements, is adequate to manage the aging effects for which it is credited in the LRA.

During its audit, the staff reviewed the applicant’s onsite documentation supporting the applicant’s conclusion that the program elements are consistent with the elements in the GALL Report. The staff interviewed the applicant’s technical staff and reviewed the documents related to the Structures Monitoring Program, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL

AMP XI.S6.

Enhancement 1

LRA Section B.2.39 states an enhancement to the "scope of program" program element in that the Structures Monitoring Program procedure will be enhanced to include additional structures requiring aging management and "structural component" for inspection includes each of the component types identified as requiring aging management.

The staff reviewed the applicant's Structures Monitoring Program, and its AERMs under the scope of the Structures Monitoring Program. The staff noted that the Structures Monitoring Program satisfies the monitoring requirements for plant structures that are within the scope of the NRC Maintenance Rule (10 CFR 50.65). SSES structures and components that are within the scope of license renewal monitored by the Structures Monitoring Program include the following:

- Primary Containment
- Reactor Building
- Circulating Water Pumphouse and Water Treatment Building
- Control Structure
- Diesel Generator 'A, B, C & D' Building
- Diesel Generator 'E' Building
- Turbine Building
- Engineered Safeguards Service Water (ESSW) Pumphouse
- Spray Pond (includes Emergency Spillway and earthen embankment)*
- Clarified Water Storage Tank Foundation
- Condensate Storage Tank Foundation and Retention Basin
- Diesel Generator Fuel Oil Storage Tanks 'A, B, C, D & E' Foundation and Vault*
- Refueling Water Storage Tank Foundation
- Station Blackout component foundations and structures in the yard (Startup Transformers T-10 and T-20 and associated disconnect switches, ESS Transformers)*
- Cooling Tower Basins (Units 1 and 2)
- Duct banks, manholes, valve vaults (includes Spray Pond Valve Vault), instrument pits, and piping trenches (structural component groups not identified as structure/building.

The staff found this enhancement acceptable because when the enhancement is implemented, AMP B.2.39, "Structures Monitoring Program," will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2

LRA Section B.2.39 states an enhancement to the "parameters monitored or inspected" program element in that the Structures Monitoring Program and excavation procedure will be enhanced to specify that, if the below grade structural or component become accessible through excavation, the responsible engineer will inspect the exposed surfaces for age-related degradation. The Structures Monitoring Program procedure will also be enhanced to specify that the responsible engineer shall review the site ground and raw water chemistry data to validate that the below-grade environment remains non-aggressive during the PEO.

The staff reviewed the applicant’s Structures Monitoring Program, and its AERMs under the parameters monitored or inspected program element of the Structures Monitoring Program. The staff noted that the chemical analysis of groundwater at WW-2 is non-aggressive, where pH > 5.5, Chloride < 500ppm, Sulfate < 1500ppm, as demonstrated in 2006: pH 6.11; Chloride 23.1 ppm; Sulfate 43.2 ppm and in 2007: pH 6.13; Chloride 40.4 ppm; Sulfate 54.6 ppm. The staff also noted that the Structures Monitoring Program incorporates provisions for increased monitoring described in RG 1.160. This includes clarifications for monitoring under Paragraph (a)(1) of 10 CFR 50.65, including additional degradation-specific condition monitoring and increased frequency of assessments until ongoing corrective actions are complete and functional performance is assured. ACI 201.1R-68, “Guide for Making a Condition Survey of Concrete in Service” is used as a source by the applicant for observing concrete deterioration and surface conditions. The staff further noted that the applicant’s assessments are performed in accordance with ANSI/ASCE 11-90, Guideline for Structural Condition Assessments of Existing Buildings, and consider the following:

- Function - Component design features, design basis, operational and maintenance history.
- Existing degradation conditions - Locations, extent, rates.
- Degradation effects upon structural or component function - Structural safety, containment, personnel safety, and protection of equipment. SSES does not employ a de-watering system in any of the site structures for control of settlement. If a below grade structural wall or structural component becomes accessible through excavation, a follow-up action is initiated for the responsible engineer to inspect the exposed.

The staff found this enhancement acceptable because when the enhancement is implemented, AMP B.2.39, “Structures Monitoring Program,” will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 3

LRA Section B.2.39 states an enhancement to the “parameters monitored or inspected” and the “acceptance criteria” program elements of the Structures Monitoring Program in that the procedure will be enhanced to include a degradation mechanism for elastomers and an earthen embankment inspection.

The staff reviewed the applicant’s Structures Monitoring Program, and its AERMs under the parameters monitored or inspected, and acceptance criteria program elements of the Structures Monitoring Program. The staff found that the additional structures that require monitoring for license renewal are appropriately included in the Structural Monitoring program. The staff also found the addition of inspection and acceptance criteria for elastomers and earthen embankment inspection to the Structural Monitoring program acceptable because when the enhancement is implemented, AMP B.2.39, “Structures Monitoring Program,” will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 4

LRA Section B.2.39 states an enhancement to the “scope of program” and “parameters monitored or inspected” program elements of the Structures Monitoring Program in that the procedure will be enhanced to include RG 1.127 inspection elements for water control structures.

The staff reviewed the applicant's Structures Monitoring Program, and its AERMs under the scope of program and the parameters monitored or inspected program elements of the Structures Monitoring Program. The staff finds that the applicant omitted the acceptance criteria program element enhancement for Water Control Structures, which should also have been included as part of this enhancement. Therefore, RAI B.2.39-1 was issued. In the letter dated July 8, 2008, the applicant indicated that the LRA Section B.2.39, Structures Monitoring program, is amended to include the Acceptance Criteria for RG 1.127, Water Control Structures Inspection. The staff reviewed the applicant's enhancement described above and its response

to the RAI and found them acceptable, because when the enhancement is implemented, AMP B.2.39, "Structures Monitoring Program," will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 5

LRA Section B.2.39 states an enhancement to the "acceptance criteria" program element of, the Structures Monitoring Program in that the procedure will be enhanced to specify that the extent of observed masonry cracking and/or degradation of steel edge supports/bracing are evaluated, and corrective action is required to ensure that the current evaluation basis is still valid.

The staff reviewed the applicant's Structures Monitoring Program and its AERMs under the acceptance criteria program element of the Structures Monitoring Program. The staff noted that inspection criteria used to assess the condition of structures and structural components include the following:

- Concrete is inspected for loss of material, cracking and change in material properties aging effects.
- Masonry walls are inspected for cracking aging effect.
- Steel and other metals including threaded fasteners are inspected for loss of material and cracking aging effects.
- Elastomers are inspected for cracking and change in material properties aging effects.
- Earthen structures are inspected for loss of form aging effect.

The staff also noted that the applicant's responsible engineer identifies problems with structural performance, initiates structural deficiency reports and recommends corrective action. Acceptance criteria are typically established such that corrective actions are initiated prior to loss of function. The staff found this enhancement acceptable because when the enhancement is implemented, AMP B.2.39, "Structures Monitoring Program," will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 6

In the letter dated September 23, 2008, the applicant added an enhancement to the "monitoring and trending" program element the Structures Monitoring Program to include direction for quantifying, monitoring and trending of inspection results; guidance for inspection reporting, data collection and documentation; acceptance criteria and critical parameters for monitoring degradation and for triggering level of inspection and initiating of corrective action; and better alignment with referenced Industry codes, standards and guidelines. The applicant also stated that the program will be enhanced to include specific qualification requirements for the inspector.

The staff reviewed the applicant's Structures Monitoring Program, the enhancement above, and its AERMs under the monitoring and trending program element of the Structures Monitoring Program. The staff found this enhancement acceptable because when the enhancement is implemented, AMP B.2.39, "Structures Monitoring Program," will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. The staff also reviewed the applicant's OE described in LRA Section B.2.39 and the applicant's Operation Experience Review Report, and interviewed the applicant's technical staff to confirm that the plant-specific OE have been reviewed by the applicant and is evaluated in the GALL Report. During its audit, the staff conducted a field walk-down with the applicant's technical staff in the general areas and those listed in the LRA, e.g., the Engineered Safeguards Service Water (ESSW) pumphouse's roof membranes, expansion joints and penetration leakage in the diesel generator building and the reactor building, and water leakage at penetrations located below grade exterior walls, etc. In general, the staff noticed some degradation. However, all of the observations are minor and acceptable per the applicant's inspection procedures and within the guidance of the ACI 201.1R (Guide for Making a Condition Survey of Concrete in Service) and ACI 349-3R (Evaluation of Existing Nuclear Safety-Related Concrete Structures) as recommended in the GALL Report.

The staff also confirmed that the applicant has addressed OE identified after the issuance of the GALL Report. The staff finds that the applicant's Structures Monitoring Program, with the corrective actions discussed in the LRA, has been effective in identifying, monitoring, and correcting the effects of aging on structures monitoring and the existing program OE revealed no degradation not bounded by industry experience.

On the basis of its review of the OE and discussions with the applicant's technical staff, the staff concluded that the applicant's Structures Monitoring 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 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.1.2.45, Commitment No. 34, the applicant provided the UFSAR supplement for the Structures Monitoring Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of the audit and review of the applicant's Structures Monitoring Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the enhancements and confirmed that their implementation through Commitment No. 34 prior to the period of extended operation would make the existing AMP consistent with the GALL Report AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by

10 CFR 54.21(d).

3.0.3.2.18 Regulatory Guide 1.127 Water-Control Structures Inspection

Summary of Technical Information in the Application. LRA Section B.2.40 describes the existing RG 1.127 Water-Control Structures Inspection as consistent, with enhancements, with GALL AMP XI.S7, “Inspection of Water-Control Structures Associated with Nuclear Power Plants.” The applicant stated that the program is implemented as part of the Spray Pond Inspection and Structures Monitoring Program.

The applicant also stated that, RG 1.127 Water-Control Structures are visually examined at a frequency selected to ensure there is no loss of intended function between inspections.

Staff Evaluation. During its audit and review, the staff confirmed the applicant’s claim of consistency with the GALL Report. The staff reviewed the enhancements (Commitment No. 35) to determine whether the AMP, with the enhancements, is adequate to manage the aging effects for which it is credited by the LRA.

The staff interviewed the applicant’s technical staff and reviewed the associated bases documents for the AMP B.2.40 “RG 1.127 Water-Control Structures Inspection,” which provides an assessment of the AMP elements’ consistency with GALL AMP XI.S7.

The staff also reviewed those portions of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program for which the applicant claims consistency with GALL AMP XI.S7.

Enhancement 1

LRA Section B.2.40 states an enhancement to the “scope of program” program element of the Structures Monitoring Program in that the procedure will be enhanced to add the Spray Pond (including concrete liners, emergency spillway, riser encasements and earthen embankments) to its scope for inspection.

The staff reviewed the applicant’s RG 1.127 Water-Control Structures Inspection and its AERMs under the scope of program element. The staff noted that the ultimate heat sink for SSES consists of a concrete lined Spray Pond and an ESSW Pumphouse housing four RHRSW pumps and four ESW pumps which pump the water from the Spray Pond through their respective loops and back to the Spray Pond through a network of sprays located in the Spray Pond. The staff further noted that the Spray Pond is designed in accordance with seismic category I requirements. Earthen embankments are provided along the Spray Pond to ensure a minimum freeboard of 3 feet and to direct flood water away from safety-related facilities in a controlled manner. They are managed by both the Spray Pond Inspection and the Structures Monitoring Program. The staff also noted that 1) there are no water-control structures that fall under the regulatory jurisdiction of the Federal Energy Regulatory Commission (FERC) or the U.S. Army Corps of Engineers; 2) the Spray Pond Inspection includes a visual inspection of the Spray Pond and performance of groundwater level monitoring, and is credited for managing loss of material and cracking aging effects for the concrete lined Spray Pond and its appurtenances; and 3) the Structures Monitoring Program that includes a visual inspection of the Spray Pond, ESSW Pump house, and earthen embankments, is credited for managing loss of material, cracking, and spalling. The staff’s review determined that this enhancement is acceptable because when the enhancement is implemented, the AMP B.2.40, “RG 1.127 Water-Control

Structures Inspection," will be consistent with the GALL AMP XI.S7 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2

LRA Section B.2.40 states an enhancement to the "parameters monitored or inspected" program element of the Structures Monitoring Program in that the procedure will be enhanced to include RG 1.127 Revision 1 Section C.2 inspection elements and degradation mechanisms for water control structure inspection.
The staff reviewed the applicant's RG 1.127 Water-Control Structures Inspection, RG 1.127 Revision 1 Section C.2 requirements, the Structures Monitoring Program, and their AERMs under the parameters monitored or inspected program elements of the Structures Monitoring Program. The staff noted that the Spray Pond Inspection includes activities to inspect the exposed and accessible external surfaces of the Spray Pond and its appurtenances to determine material condition and to identify any signs of degradation that might affect its structural integrity and operation adequacy. The staff also noted that the Structures Monitoring Program monitors degradation mechanisms for the structure and structural components under investigation and that a potential degradation mechanism matrix is contained in SSES design standards which includes degradation mechanisms that require monitoring for license renewal. The SMP will be enhanced to include parameters monitored and inspected for water-control structures in accordance with inspection elements listed in Section C.2 of RG 1.127 Revision 1. The staff found this enhancement acceptable because when the enhancement is implemented, the AMP B.2.40, "RG 1.127 Water-Control Structures Inspection," will be consistent with GALL AMP XI.S7 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 3

LRA Section B.2.40 states an enhancement to the "acceptance criteria" program element of the Structures Monitoring Program in that the procedure will be enhanced to include acceptance criteria as delineated in GALL AMP XI.S7 for WCS. The applicant stated that evaluation criteria provided in Chapter 5 of ACI 349.3R-96 provides acceptance criteria (including quantitative criteria) for determining the adequacy of observed aging effects and specifies criteria for further evaluation.

The staff reviewed the applicant's RG 1.127 Water-Control Structures Inspection, Chapter 5 of ACI 349.3R-96, the Structures Monitoring Program, and their AERMs under the acceptance criteria program element of the Structures Monitoring Program. The staff noted that the acceptance criteria for the Spray Pond Inspection uses the six (6) permanent piezometer wells (located in soil) along the perimeter of the Spray Pond; when the applicant determines that the actual groundwater level has reached elevation 663 feet at any one of the six piezometer locations, the following actions will be taken:

- NRC will be notified of the high (elevation 663') groundwater condition;
- Steps will be taken to identify the cause of the rise in the water level;
- An assessment of the safety impact of the occurrence will be performed;
- Appropriate actions will be taken based on the findings of the safety impact analysis.

The staff further notes that the applicant's responsible engineer identifies problems with structural performance, initiates structural deficiency reports, and recommends corrective action. Acceptance criteria are established such that corrective actions are initiated prior to loss of function.

The acceptance criteria for the Structures Monitoring Program include the following:

- Concrete is inspected for loss of material, cracking and change in material properties aging effects.
- Steel and other metals including threaded fasteners are inspected for loss of material and cracking aging effects.
- Elastomers are inspected for cracking and change in material properties aging effects.
- Earthen structures are inspected for loss of form aging effect.

The staff found this enhancement acceptable because when the enhancement is implemented, AMP B.2.40, "RG 1.127 Water-Control Structures Inspection," will be consistent with the GALL AMP XI.S7 and provide additional assurance that the effects of aging will be adequately managed.

Operating Experience. The staff also reviewed the applicant's OE described in LRA Section B.2.40, Operation Experience Review Report (RG 1.127 Water-Control Structures Inspection's section), and interviewed the applicant's technical staff to confirm that the plant-specific OE have been reviewed by the applicant. The applicant indicated that it found some minor indications that did not affect the structural integrity of any of the structures reviewed. The staff found that visual examinations conducted by the Spray Pond Inspection as implemented by the Structures Monitoring Program have not found any age-related problems or degraded conditions that could affect their intended function. The SSES RG 1.127 Water-Control Structures Inspection has demonstrated that it provides assurance that aging effects are being managed. The staff also confirmed that the applicant has addressed OE identified after the issuance of the GALL Report. The staff finds that the applicant's RG 1.127 Water-Control Structures Inspection Program, has been effective in identifying, monitoring, and correcting the aging effects on WCS and that existing program OE revealed no degradation not bounded by industry experience. The staff confirmed that the OE" 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.1.2.42, Commitment No. 35, the applicant provided the UFSAR supplement for the RG 1.127 Water-Control Structures Inspection. 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 the audit and review of the applicant's RG 1.127 Water-Control Structures Inspection, 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 enhancements and confirmed that their implementation through Commitment No. 35 prior to the period of extended operation would make the existing AMP consistent with the GALL Report AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Fatigue Monitoring Program

Summary of Technical Information in the Application. Section B.3.1 of the LRA describes the existing program, "Fatigue Monitoring Program (FMP)." The LRA describes this program as consistent with the GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary" with enhancements. The LRA states the purpose of the program is to manage the fatigue for all Class 1 components. The FMP tracks the number and severity of critical thermal and pressure transients for the selected reactor coolant system (RCS) components. The LRA indicates that there is no exception for this program to the GALL AMP X.M1, however, enhancements will be implemented prior to the period of extended operation in order for this program to be consistent with the 10 elements described GALL AMP X.M1.

Staff Evaluation. The staff reviewed the technical information in the LRA to verify the consistency of this program to the GALL AMP X.M1 and to assess the adequacy of this program. The staff review identified several areas where it needed additional information to complete the review of the SSES FMP. The staff transmitted requests for additional information (RAIs) to the applicant by letters dated July 3, 2008 and October 22, 2008. The applicant responded to the staff RAIs by letters dated August 1, 2008 and December 12, 2008.

The program description states that FMP monitors and tracks the number and severity of critical thermal and pressure transients for the selected RCS components. In RAI B.3.1-1, the staff requested the applicant to describe how this tracking and monitoring is accomplished.

The applicant’s response indicated that the FMP is implemented by an approved engineering procedure. The critical plant transients are monitored using two methods. Some of the transients are automatically counted using computer software analysis of specific plant operating data such as temperatures, pressures and flow rates. Those events that cannot be automatically counted are manually counted by review of plant data and operating logs. The applicant indicated that the SSES cycle counting procedure assumes that every event occurs at the full design value. The staff finds this procedure provides an acceptable method to track design transient cycles for comparison to the number of cycles used in the fatigue evaluation of ASME Class 1 components.

Section 4.3.1 of the LRA indicates that the design transients are monitored using the computer software FatiguePro. In RAI B.3.1-2, the staff asked the applicant to confirm whether FatiguePro is a part of the FMP and describe the role FatiguePro has in the FMP. In addition, the staff asked the applicant to confirm whether FatiguePro is used for stress-based monitoring, and if so, list the components that are stress-based monitored.

The applicant’s response indicated that FatiguePro software is used for stress-based fatigue (SBF) monitoring of the FW nozzle forgings, FW nozzle safe ends, and the CRD penetrations. The applicant also indicated that FatiguePro is used to identify and count transient cycles from the plant operating data. The transients that cannot be automatically counted are manually entered into the FatiguePro database. FatiguePro is also used to calculate the fatigue cumulative usage factor (CUF) at the limiting plant locations.

Previous LRA reviews determined that FatiguePro may use simplifying assumptions in the SBF evaluation. The staff issued a draft regulatory information summary (RIS) 2008-xx: “Fatigue Analysis of Nuclear Power Plant Components,” May 1, 2008 (73 FR 24094) which questioned the conservatism of the simplifying assumptions used in the analysis methodology associated with a Green’s function that has been used for the detailed analysis of some components for license renewal. In RAI B.3.1-7, the staff asked the applicant to provide the following information regarding the fatigue evaluation, including environmental fatigue effects at the NUREG/CR-6260 locations:

- Provide the details for the management of environmentally-assisted fatigue components during the period of extended operation, including the elements to the AMP such as scope, qualification, method and frequency.
- For all locations where 60-year environmental CUF is below 1.0, clarify whether any of these values have been calculated using the Green's Function Methodology and if so please describe the details of how Green's Function was used to calculate the CUF values.

The applicant's response indicated that all eleven locations in LRA Table 4.3-3 will be managed for environmentally-assisted fatigue by the SSES FMP. The applicant also indicated that the environmental CUF at these locations would be updated once every fuel cycle and corrective actions would be initiated prior to the CUF reaching the allowable limit at the monitored locations. The staff finds this response acceptable because the applicant will monitor the fatigue usage on a periodic basis and initiate appropriate corrective actions prior to the fatigue CUF exceeding its allowable limit.

The applicant's response indicated that the Green's Function Methodology was used for the SBF monitoring of the FW nozzle forging and nozzle safe end. In its response to RAI B3.1-1, the applicant indicated that the SBF methodology had been benchmarked against the relevant design basis stress report for each component. The staff requested that the applicant provide additional information regarding the benchmarking of the methodology. In RAI 4.3-11, the staff requested that the applicant provide the following additional information regarding the benchmarking of the SBF methodology:

a. Describe the procedure used to benchmark the SBF monitoring locations against the relevant design reports. List the transients used for the benchmarking and indicate the design fatigue usage associated with each transient.

b. Discuss how the SSES SBF monitoring addresses the concern raised in proposed Regulatory Information Summary (RIS), "Fatigue Analysis of Nuclear Power Plant Components," May 1, 2008 (73 FR 24094). Indicate whether any additional benchmarking of the SSES SBF monitoring is planned.

The applicant's response described the procedure used to benchmark the SBF fatigue monitoring locations for the FW nozzle safe and the CRD penetration locations. The applicant indicated that key transient pairings from the design basis stress reports were used to adjust the Green's functions so the stresses from the Green's function bounded the stresses from the design report. The adjustment assures that the Green's function stresses bounded the stresses from the design report for the key transient pairings.

The applicant also indicated that the benchmark calibrations were not performed for all possible transient pairing scenarios. The applicant could not confirm that the benchmark calibration procedure for the key transient pairings fully addressed all possible transient pairing scenarios. Therefore, the applicant committed (Commitment No. 60) to either: (1) implement fatigue monitoring software that satisfactorily addresses all issues raised in the proposed RIS, or (2) perform a confirmatory ASME Code, Section III fatigue evaluation for the SBF monitored locations to justify the existing FatiguePro methodology used at SSES Units 1 and 2. This commitment will be completed prior to the period of extended operation. The staff finds the applicant's commitment adequately addresses the technical concern indentified in the draft RIS and is acceptable.

Enhancement 1

The FMP has an enhancement to the GALL Report program elements "preventive actions, monitoring and trending." The LRA states that additional actions may be taken when sufficient fatigue accumulation has occurred, if determined necessary to address fatigue-related concerns. The staff found the above LRA statement does not provide sufficient details to determine that FMP will prevent the design limit being reached. In RAI B.3.1-3, the staff asked the applicant to explain what is meant by sufficient fatigue accumulation, describe the criteria used to determine if further actions are required, and to provide the periodicity of the updates for CUF values.

The applicant's response indicated that it had revised LRA Commitment No. 43 to include specific action levels be determined for each monitored location. The revised commitment requires the applicant to initiate actions at least 4 years prior to the projected CUF of any monitored component reaching its allowable limit. In addition, the applicant committed to update the fatigue calculation at least once every refueling cycle. The staff finds the applicant's revised Commitment No. 43 provides adequate assurance that corrective actions will be initiated prior to exceeding the allowable limit at any of the locations monitored by the SSES FMP.

The staff found this enhancement acceptable because when the enhancement is implemented, the applicant's program will be consistent with the recommendations of GALL AMP X.M1.

Enhancement 2

The FMP has an enhancement to the GALL Report program elements "preventive actions and acceptance criteria." This enhancement will address environmental effects on fatigue at specified locations in NUREG/CR-6260. The staff reviewed this enhancement and found that it does not apply to the "preventive actions" and "acceptance criteria" elements of GALL AMP X.M1. These two elements in the GALL AMP relate to maintaining the fatigue usage factor below the design limit and monitoring the plant transients. The enhancement therefore is not applicable to these program elements. In RAI B3.1-4, the staff asked the applicant to explain how this enhancement to address environmental effects is applicable to these two elements of GALL AMP X.M1.

The applicant's response provided a revision to the FMP described in LRA Appendix B, Section B.3.1 and LRA Commitment No. 43 to clarify that the enhancements to address environmental effects on fatigue at the NUREG/CR-6260 locations also include monitoring the locations for environmental fatigue usage and acceptance criteria that the environmental fatigue usage does not exceed the allowable limit. The staff finds the applicant's FMP revision acceptable because it satisfies GALL AMP X.M1.

Consistent with the GALL Report X.M1, the FMP will provide for periodic updates of the fatigue usage calculations. However, the LRA is not clear on the corrective actions that will be taken if the updated CUF calculations are projected higher than the allowable limits. In RAI B.3.1-5, the staff asked the applicant to state the exact actions that will be taken if FMP projects CUF values higher than the allowable limit.

The applicant's response indicated that when an action level as defined in the response to RAI B.3.1-3 is reached, an action request will be generated to require further engineering evaluation of the monitored location. The engineering evaluation would attempt to demonstrate that the CUF remains below the allowable limit through analysis refinements. If the analysis cannot demonstrate that the CUF remains below the allowable limit, the applicant proposed the following further options:

- Repair the component
- Replace the component
- Manage the component through inspection and flaw tolerance

The applicant's proposed actions to perform an engineering evaluation to demonstrate the CUF remains within its allowable limit or repair/replacement of the component are consistent with GALL AMP X1.M1 and are acceptable. The applicant's proposal to manage the component through inspection and flaw tolerance would require NRC review and approval as stated in LRA Commitment No. 43.

In the OE section of the FMP its states that industry OE has been factored into the SSES FMP, however this section does not list or describe the applicable OE that was reviewed by the applicant. The GALL Report X.M1 recommends that industry OE is reviewed as part of the program and any applicable experience should be considered to be incorporated into the FMP. In RAI B.3.1-6 the staff asked the applicant to list the documents reviewed and provide the corresponding follow-up actions taken by SSES from any applicable experience.

The applicant's response provided a list of documents reviewed as part of its FMP. These documents included NRC bulletins and industry publications as well as other license renewal applications relevant to fatigue of RCPB components. In addition, the applicant indicated that SSES was an early participant in using fatigue monitoring of RCPB components and that SSES maintains its participation in industry peer review groups. On the basis of the applicant's response to RAI B3.1-6, the staff finds that the applicant has considered the relevant industry experience related to the fatigue of RCPB components.

The staff found this enhancement acceptable because when the enhancement is implemented, the applicant's program will be consistent with the recommendations of GALL AMP X.M1.

UFSAR Supplement. 10 CFR 54.21(d) states that the UFSAR supplement for the facility must contain a summary description of the programs and activities for managing the effects of aging. The staff did not find a UFSAR Supplement for the Fatigue Monitoring Program, B.3.1. In RAI B.3.1-8, dated July 3, 2008, the staff asked the applicant to provide the UFSAR Supplement for AMP B.3.1.

In response to RAI B.3.1-8, dated August 1, 2008, the applicant provided an amendment to LRA Appendix A to address the FMP. The amendment added a new Section A.1.2.49, Commitment No. 43, which described the FMP, including the program enhancements that will be implemented prior to the period of extended operation. In addition, the UFSAR Supplement specifies corrective actions that will be implemented if the fatigue usage at any monitored location is projected to exceed its design limit prior to the period of extended operation. The staff reviewed the applicant's LRA amendment and finds that provides an adequate summary description of the FMP.

The staff reviewed the UFSAR supplement and determines that it provides an adequate summary description of the program as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's Fatigue Monitoring Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. The staff has reviewed the information provided in Section B.3.1 of the LRA and additional information provided by the applicant by letters dated August 1, 2008 and December 12, 2008. Also, the staff reviewed the enhancements and confirmed that they will be implemented through Commitment No. 43 prior to the period of extended operation. On the basis of its review as discussed above, 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).

Conclusion. The staff has reviewed the information provided in Section B.3.1 of the LRA and additional information provided by the applicant by letters dated August 1, 2008 and December 12, 2008. On the basis of its review as discussed above, 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 Fuse Holders Program

Summary of Technical Information in the Application. LRA Section B.2.50 describes the new Fuse Holders Program as consistent, with exception, with GALL AMP XI.E5, "Fuse Holders." The applicant stated that this aging management program will manage increased connection resistance due to fatigue of the fuse holder metallic clamp for fuse holders in the scope of the program. This program will be used to ensure that the metallic clamps of the fuse holders are not loosening due to removal and reinsertion of fuses.

In the LRA, Section 3.6.2.3.1, the applicant states that the fuse holders are located in metallic electrical boxes (terminal boxes) which have covers that protect the interior of the box from the environment. The applicant also states that the boxes are not exposed to weather (they are located indoors at SSES); they are not exposed to chemical contamination or spills. Therefore, the applicant concluded that chemical contamination, corrosion, and oxidation are not applicable aging effects for the metallic clamps of the fuse holders within the license renewal scope at SSES. With respect to electrical transients and ohmic heating, the applicant states that these fuses are not heavily loaded and do not experience frequent electrical and thermal cycling. The power fuses with bolted connections used Belleville washers to maintain good electrical contact in event of any differential thermal expansion. With respect to vibration, the applicant states that the electrical boxes are mounted on walls; vibration is not an applicable aging mechanism.

Furthermore, the applicant states that inspection of a sample of the 20 in-scope metal electric boxes containing the fuse holders showed no corrosion or evidence of water intrusion or collection and the metallic electrical boxes were clean and dry.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception is adequate to manage the aging effects for which the LRA credits it. The staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed and compared the "scope of program," "preventative actions," "parameters monitored/detected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "operating experience" program elements of the AMP to the corresponding program element criteria in GALL AMP XI.E5, "Fuse Holders."

Exception 1

LRA Section B.2.50 states an exception to the "parameters monitored/inspected" program element of GALL AMP XI.E5 such that it monitors only the mechanical fatigue of the metallic clamp portion of the fuse holder caused by removal and insertion of the fuse. The applicant stated that none of the other aging effects/mechanisms identified in this GALL Report element are applicable. The staff noted that the in-scope fuse holders are installed in metal terminal boxes, which are separate from sources of vibration. Therefore, vibration is not an applicable aging mechanism. The terminal boxes are located inside the rooms that have a controlled environment that protects the panels from the weather. They are not exposed to potential system leakage or spills. With regard to internal moisture, the applicant inspected a sample of terminal boxes and found the surface condition of the terminal boxes showed no signs of corrosion or water intrusion. Therefore, corrosion is not an applicable aging mechanism. With respect to thermal ohmic heating or thermal cycling, these fuse holders are not used in heavy loading (control powers). In addition, these fuse holders are bolted connections using Belleville washers to prevent thermal expansion of different material. Based on this information, the staff determines that ohmic heating, thermal cycling or electrical transients, vibration, chemical contamination, corrosion and oxidation are not applicable aging mechanisms/effects for the metallic clamps of the fuse holders within the scope of license renewal at SSES. Therefore, the staff finds that the exception to the "parameters monitored/inspected" element acceptable.

The staff compared the programs elements in the applicant's program to those in GALL AMP XI.E5 and verified that the program elements were consistent. The staff found the applicant's AMP acceptable because it conforms to the recommended GALL Report AMP with the exception described above.

Operating Experience. The staff reviewed the applicant's OE described in LRA Section B.2.50. The applicant stated that the Fuse Holders Program is a new program for which there is no SSES-specific OE. The applicant also stated that during routine preventive maintenance activities in 2005, a fuse holder in a Unit 1 FW control panel was identified as being slightly warmer than other fuse holders in the same location due to loosening of the fuse holder metallic clamps. The fuse holder was replaced, and post-maintenance testing, using thermography, confirmed the condition was corrected. In addition, the applicant stated that in 2004, a fuse holder in a Unit 2 reactor building chiller control panel was identified as being slightly warmer than other fuse holders in the same location due to loosening of the fuse holder metallic clamps. The fuse holder was replaced, and post-maintenance testing, using thermography, confirmed the condition was corrected. The condition was detected prior to loss of intended function in both of these cases.

The staff finds that the OE identified above demonstrates that the applicant's identification of early problems with fuse holders and correction of them prior to loss of intended functions provide assurance that the program will remain effective in assuring that equipment is maintained during the period of extended operation.

The staff finds 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.1.2.51, Commitment No. 59, the applicant provides its UFSAR Supplement for the Fuse Holders Program. The staff reviewed the UFSAR supplement and determines that it provides an adequate summary description of the program as required by 10 CFR 54.21(d). The applicant has committed to implement this AMP prior to the period of extended operation.

Conclusion. On the basis of its review of the applicant’s Fuse Holders Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and its justification and determines that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3 AMPs Not Consistent with or Not Addressed in the GALL Report

In LRA Appendix B, the applicant identified the following AMPs as plant-specific:

- Area-Based Nonsafety-affecting Safety Inspection
- Leak Chase Channel Monitoring Activities
- Preventive Maintenance Activities - RCIC/HPCI Turbine Casings

For AMPs not consistent with or not addressed in the GALL Report the staff performed a complete review to determine their adequacy to monitor or manage aging. The staff’s review of these plant-specific AMPs is documented in the following sections.

3.0.3.3.1 Area-Based Nonsafety-Affecting Safety (NSAS) Inspection

Summary of Technical Information in the Application. LRA Section B.2.46 describes the Area-Based NSAS Inspection Program as plant-specific. This program involves a one-time inspection of the internal surfaces of nonsafety-related components that are exposed to non-radioactive drainage water or potable water environments. Also inspected are the internal surfaces of copper alloys exposed to raw water from the spray pond/cooling tower. The applicant stated that the one-time inspection will ensure that the structural integrity of nonsafety-related components is maintained such that spatial interactions such as leakage will not result in the loss of intended function of safety-related components during the period of extended operation.

Staff Evaluation. The staff reviewed the Area-Based NSAS Inspection against the AMP elements found in the GALL Report, in the SRP-LR Section A.1.2.3, and tin SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 program 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 LRA Section B.1.3, Quality Assurance Program and Administrative Controls. The staff's evaluation of LRA Section B.1.3 program is discussed in SER Section 3.0.4. The remaining seven elements are discussed below.

Scope of Program

LRA Section B.2.46, states that the scope of this program includes confirming the environmental and/or internal surface conditions of nonsafety-related carbon steel, cast iron, copper alloy, and stainless steel components in systems that contain non-radioactive equipment/area drainage water or potable water, as well as for copper alloy components in systems that contain raw water. The applicant further stated that if ammonia or ammonium compounds are found in systems containing non-radioactive equipment/area drainage water or potable water, as well as for copper alloy components in systems that contain raw water, a sample of copper alloy components will be examined for evidence of SCC.

The staff reviewed the applicant’s “scope of the program” program element against the criteria in SRP-LR Section A.1.2.3.1 which states that “The specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.”

The staff finds that the applicant identified the program necessary for license renewal and specified the specific structures and components consistent with SRP-LR Section A.1.2.3.1.

The staff confirmed that the “scope of program” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

Preventive Actions

LRA Section B.2.46 states that no actions are taken as part of the Area-Based NSAS Inspection to prevent aging effects or to mitigate aging degradation.

The staff reviewed the applicant’s “preventive actions” program element against the criteria in SRP-LR Section A.1.2.3.2-2, which states that condition monitoring or performance monitoring programs do not rely on preventive actions.

Since this is a condition monitoring program, the staff concludes that this program does not rely on preventive actions. The staff confirmed that the “preventive actions” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.2-2. The staff finds this program element acceptable.

Parameters Monitored or Inspected

LRA Section B.2.46 states that parameters inspected will include wall thickness and/or visual evidence of internal surface degradation. If ammonia or ammonium compounds are detected, the internal surfaces of copper alloy components will be inspected using visual or volumetric inspection to detect SCC.

The staff reviewed the applicant's "parameters monitored or inspected" program element against the criterion in SRP-LR Section A.1.2.3.3-1, which states that, "The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s)."

The applicant describes what kind of inspections will be conducted. The applicant also discusses that degradation of these nonsafety-related systems and components (while not expected) are conducted to ensure that spatial interactions do not occur that could impair or prevent a safety-related function. The applicant also states that a focused characterization of conditions is warranted to provide confirmation of a lack of degradation or to serve as the basis for recurring actions during the period of extended operation, if required.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.3-1. The staff finds this program element acceptable.

Detection of Aging Effects

LRA Section B.3.46 states: "The Area-Based NSAS Inspection will use a combination of established volumetric and visual examination techniques performed by qualified personnel on a sample population of subject nonsafety-related components exposed to non-radioactive equipment/area drainage water or potable water to identify evidence of a loss of material or to confirm a lack thereof. The results of the inspection will be applied to all of the components within the scope of the inspection activity."

The LRA also states: "If needed, based on engineering evaluation, the Area-Based NSAS Inspection, will use a combination of established volumetric and visual examination techniques performed by qualified personnel on a sample population of select nonsafety-related systems, structures, and components. This program will use a combination of volumetric and visual examination techniques on a sample population to identify evidence of loss of material or to confirm lack of it. This program will also use a combination of volumetric and visual examination techniques on a sample population to identify evidence of SCC or a lack of SCC."

The staff reviewed the applicant's "detection of aging effects" program element against the criteria in SRP-LR Section A.1.2.3.4 which states that the inspections should be the proper inspections to detect the anticipated aging effects. In addition, this program element should tell when the inspections will be conducted and, if sampling is used, how the sample size will be determined. Finally, the inspections should be concentrated in areas thought to be the most susceptible to degradation.

The applicant stated that it will use industry accepted inspections using qualified inspectors. The inspections will be conducted within 10 years of entering the period of extended operation. The locations to be inspected will be selected based on engineering evaluation and will be concentrated in areas thought to be the most susceptible to degradation.

The staff review finds that the applicant's program uses the proper types of inspections to detect the kinds of aging anticipated. The selection of locations for inspection based on engineering evaluation is also acceptable. Finally, selection of areas anticipated to have the most degradation is also acceptable.

The staff confirmed that the "detection of aging effects" program element satisfies the criterion as defined in GALL Report and in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

Monitoring and Trending

LRA Section B.2.46 states: “No actions are taken as part of the Area-Based NSAS Inspection to monitor and/or trend inspection results. This is a one-time inspection used to determine if, and to what extent, further actions such as monitoring and trending may be required. Results of inspections, including follow-up inspections, are routinely evaluated through the site corrective action process, if necessary.”

The staff reviewed the “monitoring and trending” program element and found that the SRP-LR Section A.1.2.3.5 is not applicable because this is a one-time inspection and there is no monitoring and trending unless unanticipated degradation is detected.

The staff confirmed that the “monitoring and trending” program element does not satisfy the criterion defined in SRP-LR Section A.1.2.3.5 because this is a one-time inspection so monitoring and trending does not apply. The staff finds this program element acceptable.

Acceptance Criteria

LRA Section B.2.46 states that there will be no unacceptable loss of material, wall thinning, or SCC that could result in spatial interaction with safety-related components during the period of extended operation, as determined by engineering evaluation.

The staff reviewed the applicant’s “acceptance criteria” program element against the criteria in SRP-LR Section A.1.2.3.6 which states that the acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation and the program should include a methodology for analyzing the results against applicable acceptance criteria.

The structures and components inspected as part of the NSAS Inspection Program are nonsafety-related structures and components and this is a new program. However, the applicant has identified appropriate acceptance criteria and how the age related degradation will be evaluated. On the basis of its review, the staff finds this program element acceptable.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

Operating Experience. The staff reviewed the applicant’s OE described in LRA Section B.2.26. The applicant stated that the Area-Based NSAS Inspection is a new one-time inspection for which there is no OE indicating the need for an aging management program.

In a letter dated June 10, 2008 the staff issued RAI B.2-1 that is consistent with the statement in the SRP-LR Section A.1.2.3.10, that the applicant make a commitment to provide OE in the future to the staff for new AMPs to confirm their effectiveness for the period of extended operation. In its letter dated July 8, 2008, the applicant responded to RAI B.2-1 and stated that OE for new aging management programs described in LRA Appendix B will be gained as these new programs are implemented during the period of extended operation. The applicant stated that results of tests, inspections, and other aging management activities conducted in accordance with these programs will be subject to confirmation and corrective action elements of the Susquehanna 10 CFR Part 50, Appendix B, quality assurance program and that results will be subject to NRC review during regional inspections under existing NRC inspection modules. The applicant further stated that one-time inspections will be performed prior to entry to the period of extended operation to confirm the effectiveness of these aging management programs, and that these programs are subject to review under NRC Inspection Procedure 71003, Post-Approval Site Inspection for License Renewal.

The staff noted that post-approval site inspections provide an opportunity for staff review and assessment of the effectiveness of the applicant's Area-Based NSAS Inspection Program after the applicant has developed OE with that program. The staff concludes that the corrective action program, based on internal and external plant OE, would capture OE in the future to support the conclusion that the effects of aging are adequately managed. On this basis, the staff finds the response acceptable.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP_LR Section A.1.2.3.10. The staff finds that this program element acceptable.

UFSAR Supplement. In LRA Section A.1.2.1, Commitment No. 40, the applicant provided the UFSAR supplement for Area Based Nonsafety Affecting Safety Inspection Program. The applicant has committed to implementing the Area Based Nonsafety Affecting Safety Inspection Program within the 10 year period prior to 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 the review of the applicant's Area Based Nonsafety Affecting Safety Inspection Program including the applicant's response to the staff RAI, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions of these components will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.2 Leak Chase Channel Monitoring Activities

Summary of Technical Information in the Application. LRA Section B.2.47 describes the existing Leak Chase Channel Monitoring Activities as plant-specific. In the LRA, the applicant stated that AMP B.2.47 is an existing plant-specific condition monitoring program consisting of observation and surveillance activities to detect leakage from the spent fuel pool and the fuel shipping cast storage pool liners due to age-related degradation within the scope of license renewal.

Staff Evaluation. The staff reviewed the Leak Chase Channel Monitoring Activities against the AMP elements found in the GALL Report, in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 program elements. The staff's evaluations on seven of these elements follow.

Scope of the Program

LRA Section B.2.47 states that the program includes periodic monitoring of the spent fuel pool and fuel shipping cask storage pool leak chase system. The applicant also stated that the program is credited for supplementing the BWR Water Chemistry Program for managing loss of material aging effects for the spent fuel pool and fuel shipping cask storage pool liners.

The staff reviewed the applicant's "scope of the program" program element against the criteria in SRP-LR Section A.1.2.3.1, which states that the scope of the program should include the specific structures and components of which the program manages the aging. The staff found the applicant has identified the specific structures and components of which the aging effects are managed. On this basis, the staff finds the applicant's scope of the program acceptable.

The staff confirmed that the "scope of the program" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

Preventive Actions

LRA Section B.2.47 states that no actions are taken as part of the program to prevent aging effects or mitigate age-related degradation.

The staff reviewed the "preventive actions" program element criterion in SRP-LR Section A.1.2.3.2 which states that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided. Therefore, this program element is acceptable because this is a condition monitoring program and there is no need for preventive actions.

Parameters Monitored or Inspected

LRA Section B.2.47 states that the spent fuel pool and fuel shipping cask storage pool liner leak detection drain valves are periodically opened and the leak rate estimated by the volumetric method. The applicant also stated that this ensures evidence of leakage from the spent fuel pool and fuel shipping cask storage pool liner is promptly identified and corrected if necessary.

The applicant further stated that the program includes activities to cycle open and close spent fuel pool and fuel shipping cask storage pool liner drain valves and measure and report any water collected to shift supervision.

The staff reviewed the "parameters monitored or inspected" program element against the criteria in SRP-LR Section A.1.2.3.3 which states that the parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s).The staff found the program identifies the parameters to be monitored or inspected and linked them to the degradation of the particular structures and components intended functions by collecting, measuring and reporting any water collected to the shift supervision for further action.

This staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

Detection of Aging Effects

LRA Section B.2.47 states that the spent fuel pool and fuel shipping cask storage pool drain valves are cycled and the volume of any water collected is measured. The applicant also stated that estimating the time from start of opening valve until flow slows to a slow drip is also performed for known leakage.

The staff reviewed the “detection of aging effects” program element against the criteria in SRP-LR Section A.1.2.3.4, which states that the parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. The staff found the applicant has identified the drain valves for the spent fuel pool and fuel shipping cask storage are cycled and the volume of any water collected is measured as required under their CLB design conditions.

This staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

Monitoring and Trending

LRA Section B.2.47 states that leak chase channel monitoring activities are performed at least once quarterly. The applicant also stated that the routine task requires that any water collected in excess of one pint is reported to shift supervision. Shift supervision will then notify Nuclear System Engineering by an appropriate mechanism. The applicant further stated that data are entered into the Shift Operations Management System log for trending purposes even if no leakage was identified.

The staff reviewed the applicant’s “monitoring and trending” program element against the criteria in SRP-LR Section A.1.2.3.5 which states that the program element describes “how” the data collected are evaluated and may also include trending for a forward look. This includes an evaluation of the results against the acceptance criteria and a prediction regarding the rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of SC intended function.

The staff found that the “monitoring and trending” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5 because the applicant provides predictability of the extent of degradation and thus effects timely corrective or mitigative actions e.g., monitoring activities are performed at least once quarterly and evaluation of the results against the acceptance criteria, and a prediction regarding the rate of degradation before a loss of structures component intended function. The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

Acceptance Criteria

LRA Section B.2.47 states the acceptance criterion is less than one pint of measured leakage from each liner leak chase drain valve. The applicant also stated that the one pint criterion is based on SSES plant-specific historical accumulation of water at Unit 2 spent fuel pool drain points.

The staff reviewed the “acceptance criteria” program element against the criteria in SRP-LR Section A.1.2.3.6 which states that the acceptance criteria of the program and its basis should be described. The staff found that the “acceptance criteria” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6 since; the applicant has provided the predetermined criteria as quantitative inspections by personnel in accordance with the approved site-specific programs. On this basis, the staff finds this program element acceptable.

Operating Experience. The staff also reviewed the applicant’s OE described in LRA Section B.2.47, “Operation Experience Review Report (Leak Chase Channel Monitoring Activities’ section)”, and to confirm that the plant-specific OE have been reviewed by the applicant. The staff found that the Leak Chase Channel Monitoring Activities have indicated small leakage in the Unit 2 spent fuel pool. The Unit 1 spent fuel pool and the common fuel shipping cask storage pool liners have shown no leakage. The staff reviewed CR 94-251 (April 4, 1994) Reported leakage from Fuel Pool drain valves 253082A thru valves 253082E and found: for the first time in three months, valves 253082A has 40 gallons, and all of other valves (valves 253082B - valves 253082E were dry. However, on December 5, 2006, OPS PM S5477 (CR 830720) identified no leakage at valve 253082A, and therefore, the tracking and trending was closed. The applicant noted in the LRA that, based on the expected leakage from this small leak as well as minor drainage previously noted at liner drain valves “B” and “E,” the inspection frequency has been accelerated to monthly for the Unit 2 spent fuel pool. For the past five years, the Unit 2 spent fuel pool liner leakage measurements have all been within the acceptance criteria.

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.1.2.27, Commitment No. 41, the applicant provided the UFSAR supplement for the leak Chase Channel Monitoring Activities. 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 technical review of the applicant’s Leak Chase Channel Monitoring Activities, 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 Preventive Maintenance Activities - RCIC/HPCI Turbine Casings

Summary of Technical Information in the Application. LRA Section B.2.48 describes the existing Preventive Maintenance Activities – RCIC/HPCI Turbine Casings as a plant-specific AMP. The applicant stated that this program manages loss of material due to general corrosion on internal surfaces of RCIC and HPCI pump casings, and on piping and piping components such as rupture disks and valve bodies made of carbon steel or cast iron.

Staff Evaluation. The staff reviewed the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings as an existing program that is plant-specific. There is no corresponding AMP in the GALL Report.

The staff reviewed the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings Program against the AMP elements found in SRP-LR Section A.1.2.3 and SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of 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 LRA Section B.1.3, Quality Assurance Program and Administrative Controls. The staff's evaluation of LRA Section B.1.3 program is discussed in SER Section 3.0.4. The remaining seven elements are discussed below.

Scope of Program

LRA Section B.2.48 states that this program will manage loss of material due to general corrosion of the internal carbon steel and cast iron surfaces in the RICI and HPCI pump turbine casings and in-scope piping and piping components in steam lines downstream from the steam admission valves that are exposed to ambient air during normal plant operation. The applicant stated that this ambient air internal environment is untreated and will be moist as a result of steam that has condensed and drained to the barometric condensers or vented to the drywell.

The staff reviewed the applicant’s “scope of the program” program element against the criteria in SRP-LR Section A.1.2.3.1 which states that, “The specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.”

In its letter dated October 21, 2008, in response to the NRC regional inspection of the LRA, the applicant included an enhancement in the “scope of program” program element to include a specific step to perform a visual inspection of the RCIC turbine casing. The staff finds the enhancement acceptable because the enhancement provides details that makes the “scope of program” program element satisfy the criterion defined in SRP-LR Section A.1.2.3.1.

The staff finds this program element acceptable because it adequately describes the scope of the program.

The staff confirmed that the “scope of the program” (called the “scope of activity” in the LRA) program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

Preventive Actions

LRA Section B.2.48 states that no actions are taken as part of the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings Program to prevent aging effects or to mitigate age-related degradation.

The staff reviewed the applicant’s “preventive actions” program element against the criteria in SRP-LR Section A.1.2.3.2-2., which states that condition monitoring or performance monitoring programs do not rely on preventive actions.

Since this is a condition monitoring program, the staff concludes that this program does not rely on preventive actions.

The staff confirmed that the “preventive actions” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2-2. The staff finds this program element acceptable.

Parameters Monitored or Inspected

LRA Section B.2.48 states that this program inspects the internal carbon steel surfaces of RCIC and HPCI pump turbine casings and the cast iron surfaces of the associated gland cases for signs of degradation for evidence of loss of material.

The staff reviewed the applicant's "parameters monitored or inspected" program element against the criteria in SRP-LR Section A.1.2.3.3, which states that for a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects.

By letter dated July 9, 2008, the staff issued RAI B.2.48-1 asking the applicant to provide more details of the types of inspections that will be conducted. Specifically, the staff asked the applicant to provide the method used to inspect, the frequency of inspections, and the type of data collected. By letter dated August 12, 2008, the applicant responded that the inspection of RCIC and HPCI pump turbine internals, including the casings, is a skill-based visual inspection performed by Mechanical Maintenance personnel. The inspection follows SSES procedures and includes inspections for loose parts, mechanical damage, corrosion, erosion, pitting, scare deposits, and other abnormal wear. The procedure for the HPCI turbine includes visual inspection for the turbine casing which was not included in the RCIC turbine. A commitment (Commitment No. 42) has been added to the LRA committing to an enhancement to add the visual inspection for the RCIC turbine. The applicant also stated that the frequency of inspections will be a 10-year frequency and any deficiencies noted will be entered into the corrective action program for evaluation.

The staff finds this program element acceptable, because in response to RAI B.2.48-1 the applicant has appropriately identified the inspection methods, frequency of testing and the type of data collected.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

Detection of Aging Effects

LRA Section B.2.48 states that this program will detect loss of material prior to any loss of component intended functions.

The staff reviewed the applicant's "detection of aging effects" program element against the criteria in SRP LR Section A.1.2.3.4, which states that the parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, and data collection.

The staff concluded that there was insufficient information in the LRA for this program element. By letter dated July 9, 2008, the staff issued RAI B.2.48-1 asking the applicant to provide more details of the types of inspections that will be conducted. Specifically, the staff asked the applicant to provide the method used to inspect, the frequency of inspections, and the type of data collected. By letter dated August 12, 2008, the applicant responded that the answer to this

RAI is contained in the response to RAI B.2.48 discussed under the “parameters monitored or inspected” program element.

The staff finds this program element acceptable because it is a condition monitoring program that uses inspection techniques to identify loss of material and the response to the RAI gives adequate details of the inspection techniques.

In its letter dated October 21, 2008, in response to the NRC regional inspection of the LRA, the applicant included an enhancement in the “detection of aging effects” program element to add requirements to have inspections performed by qualified personnel using VT-3 or equivalent inspection methods, and to document and trend inspection results.

The staff finds the enhancement acceptable because the applicant has provided qualifications of personnel performing the visual inspections.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

Monitoring and Trending

LRA Section B.2.48 states that “this is a condition monitoring program that uses visual inspections to identify internal degradation of turbine casings. The observation of significant, unusual, or unexpected casing degradation is noted and is followed up by writing a condition report. The condition report may result in a condition assessment or further inspection. The disposition of the condition may result in a change in the frequency of inspection.”

The SRP-LR Section A.1 2 3.5 states that: “Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide OE may be considered in evaluating the appropriateness of the technique and frequency.”

The staff finds that the “monitoring and trending” program element is acceptable because, in response to RAI B.2.48-1, the applicant has supplied sufficient detail for the staff to find that monitoring and trending activities have been described and any significant degradation will result in a condition assessment that will determine if more frequent inspections are required.

In its letter dated October 21, 2008, in response to the NRC regional inspection of the LRA, the applicant included an enhancement in the “monitoring and trending” program element to add requirements to have inspections performed by qualified personnel using VT-3 or equivalent inspection methods, and to document and trend inspection results.

The staff finds the enhancement acceptable because the applicant has indicated that qualified personnel will document and trend inspection results, which make the “monitoring and trending” program element, satisfy the criterion defined in SRP-LR Section A.1.2.3.5

The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

Acceptance Criteria

LRA Section B.2.48 states that the acceptance criteria for this program are no unacceptable visual indications of wall-thinning or loss of material. The applicant further stated that unacceptable in this program involves a determination by engineering evaluation that the components are degraded to the point that they may not be capable of performing their intended function until the next scheduled inspection.

The staff reviewed the applicant's "acceptance criteria" program element against the criteria in SRP-LR Section A.1.2.3.6 which states that the acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation and the program should include a methodology for analyzing the results against applicable acceptance criteria.

In its letter dated October 21, 2008, in response to the NRC regional inspection of the LRA, the applicant included an enhancement in the "acceptance criteria" program element to establish specific acceptance criteria for inspection results, similar to those of ASME Section XI, IWE 3519.1, used for pump casing inspection.

The staff finds the enhancement acceptable because specific acceptance criteria are identified in addition to the engineering evaluation for determining the extent of age related degradation.

The staff finds the "acceptance criteria" program element acceptable because the applicant has identified the acceptance criteria and will use engineering evaluation to determine the extent of degradation and the need for corrective action.

The staff finds that the "acceptance criteria" program element is acceptable because it satisfies the recommendations in the SRP-LR Section A.1.2.3.6-1.

Operating Experience. The applicant stated in LRA Section B.2.48 that a search of plant-specific OE for the most recent five-year period, no loss of pressure boundary integrity was identified that could be attributed to the applicable aging effects in the scope of this program.

The staff reviewed the applicant's "operating experience" program element against the criteria in SRP LR Section A.1.2.3.1, which states that OE with existing programs should be discussed. The OE of aging management programs, including past corrective actions resulting in program enhancements or additional programs, should be considered.

The staff reviewed the applicant's OE described in LRA Section B.2.48. The applicant stated that this program is consistent with industry practice and has proven effective in maintaining the material condition of the RCIC and HPCI pump turbine casings.

By letter dated July 9, 2008, the staff issued RAI B.2.48-2 asking the applicant to provide more details of the types of inspections that will be conducted. Specifically, the staff asked the applicant to explain how a monitoring program can ensure how monitoring for loss of material will maintain the material condition. By letter dated August 12, 2008, the applicant responded that the answer to RAI B.2.48-2 is contained in the response to RAI B.2.48-1 discussed under the "parameters monitored or inspected" program element.

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 pending acceptance of the response to RAI B.2.48-2.

UFSAR Supplement. In LRA Section A.1.2.39, Commitment No. 42, the applicant provided the UFSAR supplement for the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings Program. The staff reviewed this section and determined that the information in the UFSAR Supplement does not provide an adequate summary description of the program consistent with the SRP-LR.

By letter dated July 9, 2008, the staff issued RAI B.2.48-1 asking the applicant to provide more details of the types of inspections that will be conducted. Specifically, the staff asked the applicant to provide the method used to inspect, the frequency of inspections, and the type of data collected. By letter dated August 12, 2008, in response to RAI B.2.48-1, the applicant responded that the inspection of RCIC and HPCI pump turbine internals, including the casings, is a skill-based visual inspection performed by Mechanical Maintenance personnel. The inspection follows SSES procedures and includes inspections for loose parts, mechanical damage, corrosion, erosion, pitting, scare deposits, and other abnormal wear. In its letter dated October 21, 2008, in response to the NRC regional inspection of the LRA, the applicant revised the UFSAR supplement to include the following three enhancements:

- A specific step to perform a visual inspection of the RCIC turbine casing
- Performance of inspections by qualified personnel using VT-3 or equivalent inspection methods, and to document and trend inspection results
- Specific acceptance criteria for inspections

The applicant has revised Commitment No. 42 to include these commitments.

Based on acceptable responses to the RAI and on the amendment to the UFSAR supplement in terms of the revision to the commitment list, the staff finds the UFSAR supplement is acceptable.

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. The staff finds the applicant's Preventive Maintenance Activities – RCIC/HPCI Turbine Casings Program acceptable on the basis of its review as discussed above. The staff finds that the program will adequately manage the aging effects so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.4 Preventive Maintenance Activities – Main Turbine Casing

Summary of Technical Information in the Application. In its letter dated June 30, 2008 and September 26, 2008, the applicant added a plant-specific existing program, Section B.2.49, "Preventive Maintenance Activities – Main Turbine Casing," with an enhancement.

The applicant stated that the Preventive Maintenance Activities – Main Turbine Casing will manage loss of material due to FAC on the internal surfaces of the high pressure casing for the main turbine.

Staff Evaluation. The staff reviewed the Preventive Maintenance Activities – Main Turbine Casing 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 LRA Section B.1.3, Quality Assurance Program and Administrative Controls. The staff's evaluation of LRA Section B.1.3 program is discussed in SER Section 3.0.4. The remaining seven elements are discussed below.

Enhancement

In LRA Section B.2.49, the applicant identified an enhancement to the program to specify that the inspection of the high pressure turbine shell will consist of a visual inspection (VT-3 or equivalent) and an ultrasonic examination for wall thickness.

The staff reviewed the enhancement and determined that implementation of the enhancement will add the inspection techniques necessary to adequately manage the aging effects of loss of material due to FAC during the period of extended operation. As stated in “detection of aging effects” program element above, visual inspection will be performed to detect any age related degradation and if detected, ultrasonic inspection will be performed to determine the extent of the degradation. Based on the review, the staff finds the enhancement acceptable.

Scope of Program:

In LRA Section B.2.49, the applicant stated that this program is credited for managing loss of material due to FAC on the internal carbon steel surfaces of the high pressure casing for the main turbine that is exposed to steam during normal plant operation.

The staff reviewed the applicant’s “scope of program” program element against the criteria in SRP-LR Section A.1.2.3.1, which states that the specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.

The staff concludes that since the applicant has identified the components for which this program manages aging. The staff confirmed that the “scope of program” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

Preventive Actions:

In LRA Section B.2.49, the applicant stated that no actions are taken to prevent aging effects or to mitigate age-related degradation.

The staff reviewed the applicant’s “preventive actions” program element against the criteria in SRP-LR Section A.1.2.3.2, which states that for condition or performance monitoring programs, they do not rely on preventive actions and thus, this information need not be provided.

Since this is a condition monitoring program, the staff concludes that this program does not rely on preventive actions. The staff confirmed that the “preventive actions” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

Parameters Monitored or Inspected:

In LRA Section B.2.49, the applicant stated that the program inspects the internal carbon steel surfaces of the high pressure turbine casing for signs of degradation that might be indicative of wall-thinning or loss of material. Inspections will consist of a combination of visual examination and non- destructive testing.

The staff reviewed the applicant’s “parameters monitored or inspected” program element against the criteria in SRP-LR Section A.1.2.3.3, which states that for a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects.

Since this is a condition monitoring program, the applicant has appropriately identified the parameter to be inspected and the method of inspection. The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

Detection of aging effects:

In LRA section B.2.49, the applicant stated that the program will rely on established NDE techniques, including visual (VT-3 or equivalent) inspection of accessible surfaces and ultrasonic inspections of selected locations by qualified personnel to identify surface degradation and wall thickness. Inspections are performed on a nominal 10-year (12-year maximum) frequency based on manufacturer recommendation.

The staff reviewed the applicant’s “detection of aging effects” program element against the criteria in SRP-LR Section A.1.2.3.4, which states that the parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects.

The staff reviewed the operating experience provided by the applicant and noted that based on significant modification work performed on the high pressure turbines during the last five years, no indication of pressure boundary wear was found on the high pressure turbine outer casing. The staff finds that based on plant operating experience, the frequency of once every ten years based on manufacturer’s recommendation is acceptable. If visual inspection identifies aging degradation, ultrasonic inspection will be performed to determine the extent of the degradation.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

Monitoring and Trending:

In LRA Section B.2.49, the applicant stated that this program is a condition monitoring program that is performed by qualified individuals at established intervals through a combination of visual inspection and ultrasonic testing. The applicant further stated that if during the inspection, significant or unusual or unexpected casing deterioration is observed, it will be documented on a condition report (CR); and based on analysis, the CR may result in further inspection or change in frequency.

The staff reviewed the applicant's "monitoring and trending" program element against the criteria in SRP-LR Section A.1.2.3.5, which states that monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency.

During the review process, the staff determined that monitoring and trending is not described in enough detail to allow an assessment of the predictability of the extent of degradation. As a result, the staff issued RAI B.2.49-1, by letter dated July 23, 2008, requesting the applicant to provide details describing the methods to assess remaining component life for loss of material using inspection results such that timely mitigative action can be made.

In its letter dated August 22, 2008, in response to RAI B.2.49-1 the applicant stated that the inspection is conducted to evaluate the condition of the internal surfaces of the turbine casing and looks for indications of corrosion, and should erosion be detected the condition would be evaluated under the corrective action program, which would determine the margin to minimum wall thickness, acceptability of current condition and future actions including further monitoring and trending. The applicant also stated that the inspection and evaluation of the results are performed in conjunction with the equipment vendor representative who is present during the inspections. Furthermore, the results of the latest inspections conducted in 2003 and 2004, after 20 years of service, found no signs of erosion and the casings were in excellent condition.

The staff reviewed the applicant's response and noted that enough information is provided to conclude that the applicant would appropriately identify the degraded condition, and if found, it would be evaluated along with the need for further monitoring and trending. On this basis, the staff finds the response acceptable.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

Acceptance Criteria:

In LRA Section B.2.49, the applicant stated that any indications or relevant conditions of degradation will be evaluated. The inspection observations will be compared to predetermined acceptance criteria. Inspection results that do not meet the acceptance criteria will be entered into the corrective action program for evaluation.

The staff reviewed the applicant's "acceptance criteria" program element against the criteria in SRP-LR Section A.1.2.3.6, which states that the acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation. The program should include a methodology for analyzing the results against applicable acceptance criteria.

The applicant did not provide specific acceptance criteria or its basis such as comparison to design minimum wall or manufacturer suggested minimum wall in order to provide the basis for evaluation. The staff issued RAI B.2.49-2 by letter dated July 23, 2008 requesting the applicant to provide more details on how acceptance criteria will be established.

In its letter dated August 22, 2008, in response to RAI B.2.49-2, the applicant stated that the inspection is conducted to evaluate the condition of the internal surfaces of the turbine casing and looks for indications of corrosion; and should erosion be detected the condition would be evaluated under the corrective action program, which would determine the margin to minimum wall thickness, acceptability of current condition and future actions including further monitoring and trending. The applicant also stated that the inspection and evaluation of the results rely on industry experience with the turbine equipment and are performed in conjunction with the equipment vendor representative who is present during the inspections. Furthermore, the results of the latest inspections conducted in 2003 and 2004, after 20 years of service, found no signs of erosion and the casings were in excellent condition.

The staff reviewed the applicant's response and noted that enough information is provided to conclude that the applicant would appropriately identify the degraded condition, and if found, it would evaluate the need for further corrective action. Since the inspections are conducted in the presence of the equipment vendor representative, an appropriate technical review will be performed on the inspection results. On this basis, the staff finds the response acceptable.

The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

Operating Experience. In LRA Section B.2.49, the applicant stated that a review of plant OE for the most recent five-year period did not reveal any age-related degradation for the main turbine casing. The applicant further stated that both high pressure turbines have been the object of significant modifications and the work associated with these modifications revealed no indication of pressure boundary wear on the high pressure turbine outer casing.

The staff reviewed the applicant's "operating experience" program element against the criteria in SRP-LR Section A.1.2.3.1, which states that OE with existing programs should be discussed. The OE of aging management programs, including past corrective actions resulting in program enhancements or additional programs, should be considered.

The staff reviewed the OE provided by the applicant to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In its letter dated September 26, 2008, the applicant provided the UFSAR supplement Section A.2.1.50, for the Preventive Maintenance Activities – Main Turbine Casing Program. The applicant added Commitment No. 57 to enhance the program to add the inspection techniques. The staff reviewed this section and 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 technical review of the applicant's Preventive Maintenance Activities – Main Turbine Casing Program, including the applicant’s responses to the RAIs and the enhancement, 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).

3.0.4 Quality Assurance Program Attributes Integral to Aging Management Programs

3.0.4.1 Summary of Technical Information in the Application

In Sections A.1.2, “Aging Management Program and Activities,” and B.1.3, “Quality Assurance Program and Administrative Controls,” of the license renewal application (LRA), the applicant described the elements of corrective action, confirmation process, and administrative controls that are applied to the AMPs for both safety-related (SR) and nonsafety-related components. The SSES Operational Quality Assurance (OQA) 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 OQA Program regardless of the safety classification of the components. Specifically, in Section A.1.2 and Section B.1.3, respectively, the applicant stated that the QA Program implements the requirements of 10 CFR Part 50, Appendix B, and is consistent with NUREG-1800, “Standard Review Plan for Review of license Renewal Applications for Nuclear Power Plants.”

Section B.2, “Aging Management Programs,” of the LRA provided an aging management review (AMR) summary for each unique component type or commodity group determined to require aging management during the period of extended operation.

3.0.4.2 Staff Evaluation

Pursuant to 10 CFR 54.21(a)(3), an applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation. NUREG-1800, 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. Table A.1-1, “Elements of an Aging Management Program for license Renewal,” of Branch Technical Position RLSB-1 provides the following description of these quality attributes:

- Corrective actions, including root cause determination and prevention of recurrence, should be timely;

- The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective; and,

- Administrative controls should provide a formal review and approval process.

NUREG-1800, Branch Technical Position IQMB-1 noted that those aspects of the AMP that affect quality of safety-related SSCs are subject to the QA requirements of Appendix B to 10 CFR Part 50. Additionally, for nonsafety-related SCs subject to an AMR, the applicant's existing Appendix B to 10 CFR Part 50 QA program may be used to address the elements of corrective action, confirmation process, and administrative control. Branch Technical Position IQMB-1 provides the following guidance with regard to the QA attributes of AMPs:

> Safety-related SCs are subject to Appendix B to 10 CFR Part 50 requirements which are adequate to address all quality related aspects of an AMP consistent with the CLB of the facility for the period of extended operation. For nonsafety-related SCs that are subject to an AMR for license renewal, an applicant has an option to expand the scope of its Appendix B to 10 CFR Part 50 program to include these SCs to address corrective action, confirmation process, and administrative control for aging management during the period of extended operation. In this case, the applicant should document such a commitment in the Final Safety Analysis Report supplement in accordance with 10 CFR 54.21(d).

The NRC staff reviewed the applicant's aging management programs (AMPs) described in Appendix A, "Final Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs," of the LRA, and the LRDs. 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 NUREG-1800, Section A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)." Based on the NRC staff's evaluation, the descriptions of the AMPs and their associated quality attributes provided in Appendix A, Section A.1.2, and Appendix B, Section B.1.3, of the LRA are consistent with the staff's position regarding quality assurance for aging management.

3.0.4.3 Conclusion

On the basis of the NRC staff's evaluation, the staff concludes that the descriptions and applicability of the plant-specific AMPs and their associated quality attributes provided in Appendix A, Section A.1.2, and Appendix B, Section B.1.3 and Section B.2, of the LRA, 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 Aging Management of Reactor Vessel, Internals, and Reactor Coolant System

This section of the SER documents the staff's review of the applicant's AMR results for the RV, RV internals, and reactor coolant system components and component groups of:

- Reactor Pressure Vessel
- Reactor Vessel Internals

- Reactor Coolant System Pressure Boundary

3.1.1 Summary of Technical Information in the Application

LRA Section 3.1 provides AMR results for the RV, RV internals, and reactor coolant system components and component groups. LRA Table 3.1.1, “Summary of Aging Management Programs for Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL Report,” is a summary comparison of the applicant’s AMRs with those evaluated in the GALL Report for the RV, RV internals, and reactor coolant system components and component groups.

The applicant’s AMRs evaluated and incorporated applicable plant-specific and industry OE in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant’s review of industry OE included a review of the GALL Report and OE 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, RV internals, and reactor coolant system components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant’s claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff’s evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff’s audit evaluation are documented in SER Section 3.1.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant’s further evaluations were consistent with the SRP-LR Section 3.1.2.2 acceptance criteria. The staff’s audit evaluations are documented in SER Section 3.1.2.2.

The staff also conducted a technical review of the remaining AMRs not consistent with or not addressed in the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff’s evaluations are documented in SER Section 3.1.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant’s OE to verify the applicant’s claims.

Table 3.1-1 summarizes the staff’s evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.1 and addressed in the GALL Report.

Table 3.1-1 Staff Evaluation for Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel pressure vessel support skirt and attachment welds (3.1.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy RV components: flanges; nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy RCPB piping, piping components, and piping elements exposed to reactor coolant (3.1.1-3)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel pump and valve closure bolting (3.1.1-4)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) check Code limits for allowable cycles (less than 7000 cycles) of thermal stress range	Yes	Not applicable	Not applicable to SSES. (See SER Section 3.1.2.2.1)
Stainless steel and nickel alloy RV internals components (3.1.1-5)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Nickel Alloy tubes and sleeves in a reactor coolant and secondary FW/steam environment (3.1.1-6)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel and stainless steel RCPB closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting (3.1.1-7)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.1)
Steel; stainless steel; and nickel-alloy RCPB piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves (3.1.1-8)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	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 RV components: flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-9)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	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	Yes	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22), or BWR Water Chemistry Program (B.2.2) and Inservice Inspection (ISI) Program (B.2.1)	Consistent with GALL Report (See SER Section 3.1.2.2.2.1)
Steel steam generator shell assembly exposed to secondary FW and steam (3.1.1-12)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.2.1)
Steel and stainless steel isolation condenser components exposed to reactor coolant (3.1.1-13)	Loss of material due to general (steel only), pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.2.2)
Stainless steel, nickel-alloy, and steel with nickel-alloy or stainless steel cladding RV flanges, nozzles, penetrations, safe ends, vessel shells, heads and welds (3.1.1-14)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22), or BWR Water Chemistry Program (B.2.2) and Inservice Inspection (ISI) Program (B.2.1), or BWR Water Chemistry Program (B.2.2) and BWR Vessel Internals Program (B.2.9)	Consistent with GALL Report (See SER Section 3.1.2.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy RCPB components exposed to reactor coolant (3.1.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22), or BWR Water Chemistry Program (B.2.2) and Inservice Inspection (ISI) Program (B.2.1)	Consistent with GALL Report (See SER Section 3.1.2.2.2.3)
Steel steam generator upper and lower shell and transition cone exposed to secondary FW and steam (3.1.1-16)	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry and, for Westinghouse Model 44 and 51 S/G, if general and pitting corrosion of the shell is known to exist, additional inspection procedures are to be developed.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.2.4)
Steel (with or without stainless steel cladding) RV beltline shell, nozzles, and welds (3.1.1-17)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with 10 CFR Part 50, Appendix G, and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	Yes	TLAA	Loss of fracture toughness is a TLAA (See SER Section 3.1.2.2.3.1)
Steel (with or without stainless steel cladding) RV beltline shell, nozzles, and welds; safety injection nozzles (3.1.1-18)	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance	Yes	Reactor Vessel Surveillance Program (B.2.21)	Consistent with GALL Report (See SER Section 3.1.2.2.3.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy top head enclosure vessel flange leak detection line (3.1.1-19)	Cracking due to SCC and IGSCC	A plant-specific aging management program is to be evaluated.	Yes	BWR Water Chemistry Program (B.2.2) and Small Bore Class 1 Piping Inspection (B.2.31)	Consistent with GALL Report (See SER Section 3.1.2.2.4.1)
Stainless steel isolation condenser components exposed to reactor coolant (3.1.1-20)	Cracking due to SCC and IGSCC	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	Yes	Not applicable	See SER Section 3.1.2.2.4.2
Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process (3.1.1-21)	Crack growth due to cyclic loading	TLAA	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.5)
Stainless steel and nickel alloy RV internals components exposed to reactor coolant and neutron flux (3.1.1-22)	Loss of fracture toughness due to neutron irradiation embrittlement, void swelling	UFSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.6)
Stainless steel RV closure head flange leak detection line and bottom-mounted instrument guide tubes (3.1.1-23)	Cracking due to SCC	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.7.1)
Class 1 CASS piping, piping components, and piping elements exposed to reactor coolant (3.1.1-24)	Cracking due to SCC	Water Chemistry and, for CASS components that do not meet the NUREG-0313 guidelines, a plant-specific AMP	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.7.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel jet pump sensing line (3.1.1-25)	Cracking due to cyclic loading	A plant-specific aging management program is to be evaluated.	Yes	BWR Water Chemistry Program (B.2.2) and Small Bore Class 1 Piping Inspection (B.2.31)	Consistent with GALL Report (See SER Section 3.1.2.2.8.1)
Steel and stainless steel isolation condenser components exposed to reactor coolant (3.1.1-26)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD) and plant-specific verification program	Yes	Not applicable	See SER Section 3.1.2.2.8.2
Stainless steel and nickel alloy RV internals screws, bolts, tie rods, and hold-down springs (3.1.1-27)	Loss of preload due to stress relaxation	UFSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.9)
Steel steam generator FW impingement plate and support exposed to secondary FW (3.1.1-28)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.10)
Stainless steel steam dryers exposed to reactor coolant (3.1.1-29)	Cracking due to flow-induced vibration	A plant-specific aging management program is to be evaluated.	Yes	BWR Vessels Internals (B.2.9),	Consistent with GALL Report (See SER Section 3.1.2.2.11)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel RV 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 SCC, IASCC	Water Chemistry and UFSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No	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 RV 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 SCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and UFSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.13)
Steel steam generator FW inlet ring and supports (3.1.1-32)	Wall thinning due to FAC	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.14)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy RV internals components (3.1.1-33)	Changes in dimensions due to void swelling	UFSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.15)
Stainless steel and nickel alloy reactor CRD head penetration pressure housings (3.1.1-34)	Cracking due to SCC and primary water SCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.16.1)
Steel with stainless steel or nickel alloy cladding primary side components; steam generator upper and lower heads, tubesheets and tube-to-tube sheet welds (3.1.1-35)	Cracking due to SCC and primary water SCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.16.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel alloy, stainless steel pressurizer spray head (3.1.1-36)	Cracking due to SCC and primary water SCC	Water Chemistry and One-Time Inspection and, for nickel alloy welded spray heads, comply with applicable NRC Orders and provide a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.16.2)
Stainless steel and nickel alloy RV 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 SCC, primary water SCC, IASCC	Water Chemistry and UFSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No	Not applicable	Not applicable to BWRs (See SER Section 3.1.2.2.17)
Steel (with or without stainless steel cladding) CRD return line nozzles exposed to reactor coolant (3.1.1-38)	Cracking due to cyclic loading	BWR Control Rod Drive Return Line Nozzle	No	BWR CRD Return Line Nozzle (B.2.6)	Consistent with GALL Report
Steel (with or without stainless steel cladding) FW nozzles exposed to reactor coolant (3.1.1-39)	Cracking due to cyclic loading	BWR Feedwater Nozzle	No	BWR Feedwater Nozzle (B.2.5)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy penetrations for CRD stub tubes instrumentation, jet pump instrumentation, SLC, flux monitor, and drain line exposed to reactor coolant (3.1.1-40)	Cracking due to SCC, IGSCC, cyclic loading	BWR Penetrations and Water Chemistry	No	BWR Penetrations (B.2.8), BWR Water Chemistry (B.2.2)	Consistent with GALL Report
Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 NPS; nozzle safe ends and associated welds (3.1.1-41)	Cracking due to SCC and IGSCC	BWR Stress Corrosion Cracking and Water Chemistry	No	BWR Stress Corrosion Cracking (B.2.7), BWR Water Chemistry (B.2.2)	Consistent with GALL Report
Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant (3.1.1-42)	Cracking due to SCC and IGSCC	BWR Vessel ID Attachment Welds and Water Chemistry	No	BWR Vessel ID Attachment Welds (B.2.9), BWR Water Chemistry (B.2.2)	Consistent with GALL Report
Stainless steel fuel supports and CRD assemblies CRD housing exposed to reactor coolant (3.1.1-43)	Cracking due to SCC and IGSCC	BWR Vessel Internals and Water Chemistry	No	BWR Vessel Internals (B.2.9), BWR Water Chemistry (B.2.2)	Consistent with GALL Report
Stainless steel and nickel alloy core shroud, core plate, core plate bolts, support structure, top guide, core spray lines, spargers, jet pump assemblies, CRD housing, nuclear instrumentation guide tubes (3.1.1-44)	Cracking due to SCC, IGSCC, IASCC	BWR Vessel Internals and Water Chemistry	No	BWR Vessel Internals (B.2.9), BWR Water Chemistry (B.2.2) , Inservice Inspection (B.2.1)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to reactor coolant (3.1.1-45)	Wall thinning due to FAC	Flow-Accelerated Corrosion	No	Flow-Accelerated Corrosion Program (B.2.11)	Consistent with GALL Report
Nickel alloy core shroud and core plate access hole cover (mechanical covers) (3.1.1-46)	Cracking due to SCC, IGSCC, IASCC	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Not applicable	Not applicable to SSES (See SER Section 3.1.2.1.1)
Stainless steel and nickel-alloy RV internals exposed to reactor coolant (3.1.1-47)	Loss of material due to pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Not Applicable	Addressed under item 3.1.1-14 (See SER Section 3.1.2.1.1)
Steel and stainless steel Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant (3.1.1-48)	Cracking due to SCC, IGSCC (for stainless steel only), and thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	Inservice Inspection (ISI) Program (B.2.1), BWR Water Chemistry Program (B.2.2), and Small Bore Class 1 Piping Inspection (B.2.31), or Inservice Inspection (ISI) Program (B.2.1) and Small Bore Class 1 Piping Inspection (B.2.31)	Consistent with GALL Report (See SER Section 3.1.2.1.2.)
Nickel alloy core shroud and core plate access hole cover (welded covers) (3.1.1-49)	Cracking due to SCC, IGSCC, IASCC	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and, for BWRs with a crevice in the access hole covers, augmented inspection using UT or other demonstrated acceptable inspection of the access hole cover welds	No	Inservice Inspection (B.2.1), BWR Water Chemistry (B.2.2)	Consistent with GALL Report Access hole covers do not have a crevice

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
High-strength low alloy steel top head closure studs and nuts exposed to air with reactor coolant leakage (3.1.1-50)	Cracking due to SCC and IGSCC	Reactor Head Closure Studs	No	Reactor Head Closure Studs Program (B.2.3)	Consistent with GALL Report
Cast austenitic stainless steel jet pump assembly castings; orificed fuel support (3.1.1-51)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	Thermal Aging and Neutron Irradiation Embrittlement of CASS (B.2.10)	Consistent with GALL Report
Steel and stainless steel RCPB (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems (3.1.1-52)	Cracking due to SCC, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.1.1-53)	Loss of material due to general, pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.1.2.1.1)
Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water (3.1.1-54)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.1.2.1.1)
Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant > 250°C (> 482°F) (3.1.1-55)	Loss of fracture toughness due to thermal aging embrittlement	Inservice Inspection (IWB, IWC, and IWD). Thermal aging susceptibility screening is not necessary, ISI requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	No	Inservice Inspection (ISI) Program (B.2.1) Small Bore Class 1 Piping Inspection (B.2.31)	Consistent with GALL Report (See SER Section 3.1.2.1.3.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy > 15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water (3.1.1-56)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable to SSES (See SER Section 3.1.2.1.1)
Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and CRD pressure housings exposed to reactor coolant > 250°C (> 482°F) (3.1.1-57)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not Applicable	Not Applicable (See SER Section 3.1.2.1.1)
Steel RCPB external surfaces exposed to air with borated water leakage (3.1.1-58)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Not applicable	Not applicable to BWRs
Steel steam generator steam nozzle and safe end, FW nozzle and safe end, AFW nozzles and safe ends exposed to secondary FW/steam (3.1.1-59)	Wall thinning due to FAC	Flow-Accelerated Corrosion	No	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	No	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)	No	Not applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant (3.1.1-62)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	No	Not applicable	Not applicable to BWRs
Steel RV flange, stainless steel and nickel alloy RV internals exposed to reactor coolant (e.g., upper and lower internals assembly, CEA shroud assembly, core support barrel, upper grid assembly, core support shield assembly, lower grid assembly) (3.1.1-63)	Loss of material due to wear	Inservice Inspection (IWB, IWC, and IWD)	No	Not applicable	Not applicable to BWRs
Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components (3.1.1-64)	Cracking due to SCC, primary water SCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry	No	Not applicable	Not applicable to BWRs
Nickel alloy RV upper head and CRD penetration nozzles, instrument tubes, head vent pipe (top head), and welds (3.1.1-65)	Cracking due to primary water SCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of PWRs	No	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	No	Not applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant (3.1.1-67)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Not applicable	Not applicable to BWRs
Stainless steel, steel with stainless steel cladding Class 1 piping, fittings, pump casings, valve bodies, nozzles, safe ends, manways, flanges, CRD housing; pressurizer heater sheaths, sleeves, diaphragm plate; pressurizer relief tank components, reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings (3.1.1-68)	Cracking due to SCC	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	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 SCC, primary water SCC	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	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 SCC, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	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 SCC; loss of material due to wear	Reactor Head Closure Studs	No	Not applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel alloy steam generator tubes and sleeves exposed to secondary FW/steam (3.1.1-72)	Cracking due to OD SCC and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to BWRs
Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant (3.1.1-73)	Cracking due to primary water SCC	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to BWRs
Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary FW/steam (3.1.1-74)	Cracking due to SCC, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to BWRs
Nickel alloy once-through steam generator tubes exposed to secondary FW/steam (3.1.1-75)	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to BWRs
Steel steam generator tube support plate, tube bundle wrapper exposed to secondary FW/steam (3.1.1-76)	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to BWRs
Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary FW/steam (3.1.1-77)	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to BWRs
Steel steam generator tube support lattice bars exposed to secondary FW/steam (3.1.1-78)	Wall thinning due to FAC	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel alloy steam generator tubes exposed to secondary FW/steam (3.1.1-79)	Denting due to corrosion of steel tube support plate	Steam Generator Tube Integrity; Water Chemistry and, for plants that could experience denting at the upper support plates, evaluate potential for rapidly propagating cracks and then develop and take corrective actions consistent with NRC Bulletin 88-02.	No	Not applicable	Not applicable to BWRs
Cast austenitic stainless steel RV internals (e.g., upper internals assembly, lower internal assembly, CEA shroud assemblies, control rod guide tube assembly, core support shield assembly, lower grid assembly) (3.1.1-80)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	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 SCC	Water Chemistry	No	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 SCC	Water Chemistry	No	Not applicable	Not applicable to BWRs
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy RV internals and RCPB components exposed to reactor coolant (3.1.1-83)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Not applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary FW/steam (3.1.1-84)	Cracking due to SCC	Water Chemistry and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	No	Not applicable	Not applicable to BWRs
Nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.1.1-85)	None	None	No	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	No	None	Consistent with GALL Report
Steel piping, piping components, and piping elements in concrete (3.1.1-87)	None	None	No	Not applicable	Not applicable to SSES (See SER Section 3.1.2.1.1)

The staff's review of the RV, RV internals, and reactor coolant system component groups followed any one of several approaches. One approach, documented in SER Section 3.1.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.1.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.1.2.3, reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the RV, RV internals, and reactor coolant system components is documented in SER Section 3.0.3.

3.1.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.1.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the RV, RV internals, and reactor coolant system components:

- Inservice Inspection (ISI) Program
- BWR Water Chemistry Program
- Reactor Head Closure Studs Program
- BWR Vessel ID Attachment Welds Program
- BWR Feedwater Nozzle Program
- BWR CRD Return Line Nozzle Program
- BWR Stress Corrosion Cracking (SCC) Program
- BWR Penetrations Program
- BWR Vessel Internals Program
- Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program
- Flow-Accelerated Corrosion (FAC) Program
- Bolting Integrity Program
- Closed Cooling Water Chemistry Program
- Reactor Vessel Surveillance Program
- Main Steam Flow Restrictor Inspection
- Small Bore Class 1 Piping Inspection
- System Walkdown Program
- Inservice Inspection (ISI) Program - IWF

LRA Tables 3.1.2-1 through 3.1.2-3 summarize AMRs for the RV, RV internals, and reactor coolant system components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the reactor vessel, reactor vessel internals, and RCS components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.1.1, the applicant's references to the GALL Report are acceptable and no further staff review is required, with the exception of the following AMRs that the applicant had identified were consistent with the AMRs of the GALL Report and for which the staff felt were in need of additional clarification and assessment. The staff's evaluations of these AMRs are providing in the subsection that follows

3.1.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.1.1, items 46, the applicant states that the corresponding AMR result line in the

GALL Report is not applicable because access hole covers are a welded design. The staff noted that the nickel alloy core shroud and core plate access hole cover is a mechanical design for item 46. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES does not have a mechanical access hole cover. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.1.1, item 47, the applicant states that the corresponding AMR result line in the GALL Report is addressesed under item 3.1.1-14. The staff reviewed the documentation supporting the applicant's AMR evaluation in items 3.1.1-14, and no AMR line items roll up to 3.1.1-47. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.1.1, items 53, 54, 56 and 87, the applicant indicates that the corresponding AMR result line in the GALL Report is not applicable because SSES does not have the components for these items. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES does not have these components. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.1-1 line item 3.1.1-57, the applicant stated that loss of fracture toughness due to thermal aging embrittlement for 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) is not applicable because these components are included in LRA Table 3.1-1 line items 3.3.1-51 and 3.1.1-55.

The staff confirmed that the components listed under line item 3.1.1-57 are included in line items 51 and 55. The applicant has proposed using the Thermal Aging and Neutron Irradiation Embrittlement of CASS Program to manage the aging effects in line 3.1.1-51; and the Inservice Inspection, and Small Bore Class 1 Piping Inspection Programs to manage the aging effects in line 3.1.1-55. Based on this review, the staff finds that Table 3.3.1, line item 3.1.1-57 is not applicable.

3.1.2.1.2 Cracking due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking

In LRA Table 3.1.2-3, for stainless steel tubing in a treated water (reactor coolant) environment, the applicant specified use of the BWR Water Chemistry Program for managing the aging effect of cracking due to SCC or IGSCC. For this AMR result line, the applicant referred to LRA Table 3.1.1, item 3.1.1-48 and cited generic note E, indicating that the result is consistent with the GALL Report for component, material, environment and aging effect but a different AMP is used. The staff noted that for the same component, material and environment combination, the GALL report recommends use of the Inservice Inspection (IWB, IWC and IWD) Program, the Water Chemistry Program, and the One-Time Inspection of ASME Code Class 1 Small Bore Piping for managing the aging effect of cracking due to SCC or IGSCC. The staff issued RAI 3.1-4 by letter dated July 15, 2008, asking the applicant to provide technical justification that the AMP specified in the LRA provides adequate management of the aging effect during the period of extended operation.

In a letter dated August 15, 2008, the applicant responded to RAI 3.1-4 by providing the following response:

An inspection program is needed to confirm the effectiveness of the BWR Water Chemistry Program. LRA Table 3.1.2-3 is revised to credit the Inservice Inspection (ISI) Program and the Small Bore Class 1 Piping Inspection in addition to the BWR Water Chemistry Program to manage cracking for stainless steel tubing in treated water. This is consistent with the combination of aging management programs identified in GALL Report item IV.C1-1. Note A is applicable.

In LRA Table 3.1.2-3, for stainless steel condensing chambers, piping and fittings, valve bodies, and flow orifices in a treated water environment, the applicant specified use of the BWR Water Chemistry Program and the Small Bore Class 1 Piping Inspection for managing the aging effect of cracking due to SCC or IGSCC. For these AMR result lines, the applicant referred to LRA Table 3.1.1, item 3.1.1-48 and cited generic note A, indicating that the result is consistent with the GALL Report for component, material, environment, aging effect, and the AMP is consistent with the GALL Report. The staff noted that for the same or similar components and the same material and environment combination, the GALL report recommends use of the Inservice Inspection (IWB, IWC and IWD) Program, the Water Chemistry Program, and the One-Time Inspection of ASME Code Class 1 Small Bore Piping for managing the aging effect of cracking due to SCC or IGSCC. The staff issued RAI 3.1-6 by letter dated July 15, 2008, asking the applicant to provide technical justification that the applicant's recommended AMPs provide adequate management of the aging effect during the period of extended operation and justify why note A is appropriate for these AMR results lines.

In a letter dated August 15, 2008, the applicant responded to RAI 3.1-6 by providing the following response:

> The LRA Table 3.1.2-3 AMR result lines where the components are small bore piping components made of stainless steel, the environment is "treated water (internal)," the aging effect is cracking, and the AMPs are BWR Water Chemistry Program and Small Bore Class 1 Piping Inspection are revised to also credit the Inservice Inspection (ISI) Program. Also, the line entry for stainless steel tubing in LRA Table 3.1-2-3 is revised to credit both the Inservice Inspection Program and the Small Bore Class 1 Piping Inspection.
>
> In total, there are 6 AMR line entries, covering stainless steel condensing chambers, flow orifices, piping and fittings <4 inch, tubing and valves exposed to treated water subject to cracking and compared to GALL Report line item IV.C1-1. By crediting ISI for these entries and ISI and small bore inspection for the tubing, the credited programs are consistent with GALL Report line item IV.C1-1. Note A is applicable.
>
> The LRA is amended to make the necessary changes.

The staff reviewed all of the LRA changes that the applicant made in response to RAIs 3.1-4 and 3.1-6. The staff confirmed that the changes brought the applicant's AMR result lines into consistency with the corresponding AMR results in the GALL Report. Because the applicant's AMR results are consistent with the GALL Report, the staff finds the LRA changes and the applicant's AMR results for LRA Table 3.1.1, Item 3.1.1-48 to be acceptable.

LRA Table 3.1.2-3 includes AMR result lines for carbon steel piping and fittings <4" nominal pipe size (NPS) and for carbon steel valves <4" NPS in an environment of treated water and with an aging effect of cracking. The applicant specified the Small Bore Class 1 Piping Inspection, only, as the AMP to manage the aging effect of cracking for these components and cites generic note H, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. The staff noted that the components, material, environment and aging effect all appear to be consistent with GALL Report item IV.C1-1, where the recommended AMPs are the ISI Program, the Water Chemistry Program, and the One-Time Inspection of ASME Class 1 Small Bore Piping. The staff issued RAI 3.1-7 by letter dated July 15, 2008, asking the applicant to explain why note H was used for these AMR results and to justify that the AMP specified by the applicant for these components provides satisfactory aging management during the period of extended operation, comparable to the AMPs recommended in GALL Report line IV.C1-1.

In a letter dated August 15, 2008, the applicant responded to RAI 3.1-7 by providing the following response:

> GALL Report item IV.C1-1 is appropriate for comparison in the AMR result lines in the LRA Table 3.1.2-3 for piping and fittings <4 inch and for valve bodies <4 inch, for which the material is carbon steel, the environment is “treated water (internal),” and the aging effect is cracking (due to thermal and mechanical loading).
>
> The AMR results are consistent with GALL Report item IV.C1-1 for the material (steel), environment (reactor coolant) and aging effect (cracking). The LRA is revised to credit the Inservice Inspection (ISI) Program, in addition to the Small Bore Class 1 Piping Inspection, to manage cracking for the components. While GALL Report item IV.C1-1 also credits Water Chemistry, it is not applicable here, since cracking due to stress corrosion is not an aging effect for steel components. Therefore, crediting ISI and Small Bore Class 1 Piping Inspection to manage cracking due to thermal and mechanical loading is considered to be consistent with the recommendations of GALL Report item IV.C1-1. However, since PPL is crediting only two of the three programs that are listed in the GALL Report item, a note E, instead of note A, is used for the comparison to the GALL Report.

The staff reviewed the applicant’s response and the associated LRA changes. The staff noted that the mechanism associated with the aging effect of cracking in these components is thermal and mechanical loading, which is not strongly influenced by the water chemistry environment of the components. Because there is no mitigating effect provided by the BWR Water Chemistry Program for the aging mechanism of thermal and mechanical loading, the staff finds it acceptable for the applicant not to credit the BWR Water Chemistry Program for these components. Because the Small Bore Class 1 Piping Inspection provides for one-time volumetric inspections that are capable of finding cracking due to thermal and mechanical loading, and for piping <4 inch diameter the ISI program provides for periodic surface examinations and for VT-2 examinations for leakage at every refueling outage. The staff finds the applicant’s LRA changes and the revised AMR results for carbon steel piping and fittings <4 inch and for carbon steel valve bodies <4 inch in an environment of treated water with the aging effect is cracking due to thermal and mechanical loading to be acceptable.

Based on the changes that the applicant made to the LRA in response to RAIs 3.1-4 and 3.1-6, the explanation provided in response to RAI 3.1-7, and the programs identified for managing the subject aging effects, the staff determines that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.1.3 Loss of Fracture Toughness due to Thermal Aging Embrittlement

In the discussion in LRA Table 3.1.1, item 3.1.1-55, the applicant stated that for CASS valve bodies less than 4 inch NPS, the Small Bore Class 1 Piping Inspection is credited to manage loss of fracture toughness. However, in the applicant's response to RAI B.2.31-1, documented in the applicant's letter dated July 25, 2008, the applicant revised the discussion in item 3.1.1-55 to delete the statement that for CASS valve bodies less than 4 inch NPS, the Small Bore Class 1 Piping Inspection is credited to manage loss of fracture toughness. Based on this change, the applicant's Inservice Inspection Program is credited to manage loss of fracture toughness due to thermal aging embrittlement for all CASS pump casings, pump covers, thermal barriers and valve bodies exposed to reactor coolant >250ºC (>482ºF), including CASS valve bodies less than 4 inch NPS. This combination of components, material, environment, aging effect and aging management program is consistent with the recommendations in the GALL Report for item 3.1.1-55. On this basis, the staff finds the applicant's change in the LRA discussion for item 3.1.1-55 and the applicant's associated AMR results to be acceptable.

SER Section 3.1.2.1 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 OE and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.1.2.2, the applicant further evaluates of aging management, as recommended by the GALL Report, for the RV, RV internals, and reactor coolant system components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of fracture toughness due to neutron irradiation embrittlement
- cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC)
- crack growth due to cyclic loading
- loss of fracture toughness due to neutron irradiation embrittlement and void swelling
- cracking due to SCC
- cracking due to cyclic loading
- loss of preload due to stress relaxation
- loss of material due to erosion
- cracking due to flow-induced vibration
- cracking due to SCC and irradiation-assisted SCC
- cracking due to primary water SCC

- wall thinning due to FAC
- changes in dimensions due to void swelling
- cracking due to SCC and primary water SCC
- cracking due to SCC, primary water SCC, and irradiation-assisted SCC
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.1.2.2. The staff's review of the applicant's further evaluation follows.

3.1.2.2.1 Cumulative Fatigue Damage

LRA Section 3.1.2.2.1 states that fatigue is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.1.2.2.2 against the following criteria in SRP-LR Section 3.1.2.2.2:

(1) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in BWR top head and top head nozzles and PWR steam generator shell assembly. The applicant stated that the BWR Water Chemistry Program is supplemented by the Inservice Inspection (ISI) Program for managing loss of material due to general, pitting, and crevice corrosion for the steel RV upper head and the top head nozzles exposed to reactor coolant. A one-time inspection is not credited. The BWR Water Chemistry Program in association with the Small Bore Class 1 Piping Inspection manages loss of material due to general, pitting, and crevice corrosion for steel piping and valves less than 4 inches exposed to reactor coolant. The Small Bore Class 1 Piping Inspection is a one-time inspection. Loss of material for a steam generator shell assembly is only applicable to PWRs.

SRP-LR Section 3.1.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in the steel PWR steam generator shell assembly exposed to secondary FW and steam. Loss of material due to general, pitting, and crevice corrosion also may occur in the steel top head enclosure (without cladding) top head nozzles (vent, top head spray or reactor core isolation cooling (RCIC), and spare) exposed to reactor coolant. The existing program controls reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed all AMR result lines referring to LRA Table 3.1.1, item 3.1.1-11, and to LRA Section 3.1.2.2.2.1. The staff noted that the AMR results can be divided into three categories based upon the AMP proposed by the applicant: 1) AMR results where loss of material is managed by the BWR Water Chemistry Program, alone; 2) AMR results where loss of material is managed by a combination of the BWR Water Chemistry Program and the ASME Code Section XI Inservice Inspection (IWB, IWC, and IWD) program; and 3) AMR results where loss of material is managed by a combination of the BWR Water Chemistry Program and the Small Bore Class 1 Piping Inspection. For the first and second category of these AMR results, the applicant cited generic note E indicating that the material, environment and aging effect are consistent with the GALL Report but a different aging management program is credited. For AMR results in the third category, BWR Water Chemistry Program and Small Bore Class 1 Piping Inspection, the applicant cited generic note C indicating that the component is different, but the material, environment, aging effect, and AMP are all consistent with the GALL Report.

As a result of its review of the applicant's AMP B.2.31, Small Bore Class 1 Piping Inspection, and the applicant's AMR results, the staff issued requests for additional information in letters dated June 23, 2008, and July 15, 2008:

- RAI B.2.31-1 asked the applicant to reconcile inconsistencies related to the applicant's claim that the Small Bore Class 1 Piping Inspection is consistent with GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small Bore Piping."

- RAI 3.1-1 asked the applicant to justify how the BWR Water Chemistry Program, alone, would provide adequate aging management for loss of material for those AMR results where no inspection was specified to confirm effectiveness of the water chemistry program.

- RAI 3.1-2 asked the applicant to explain why confirmation of effectiveness of the BWR Water Chemistry Program is not needed with regard to managing the aging effect of loss of material in carbon steel main steam flow elements/restrictors exposed to treated water.

- RAI 3.1-3 asked the applicant to explain why generic note A or note C, indicating that the AMP used is consistent with the AMP recommended in the GALL Report, was used for multiple AMR result lines in Table 3.1.2-3 where the applicant proposed using the BWR Water Chemistry Program in combination with the Small Bore Class 1 Piping Inspection, but the GALL Report recommends GALL AMP XI.M2, "Water Chemistry," in combination with GALL AMP XI.M32, "One-Time Inspection," for managing loss of material.

The applicant responded to RAI B.2.31-1 in a letter dated July 25, 2008, and to RAIs 3.1-1, 3.1-2, and 3.1-3 in a letter dated August 15, 2008. In those responses, the applicant revised all of the AMR results that referred to LRA Table 3.1.1, item 3.1.1-11, where the aging effect was managed either by the BWR Water Chemistry Program, alone, or by the BWR Water Chemistry Program in combination with the Small Bore Class 1 Piping Inspection. In the revised AMR results, the applicant proposes to manage loss of material for carbon steel components exposed to treated water with a combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection. The staff finds that use of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection is consistent with recommendations in the GALL Report, and issues raised in RAIs B.2.31-1, 3.1-1, 3.1-2, and 3.1-3 were resolved by the applicant's changes to the LRA made in response to these RAIs.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the applicant's BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to general, pitting, and crevice corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the applicant's Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The applicant's Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to general, pitting, and crevice corrosion, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection for loss of material due to general, pitting, and crevice corrosion, the staff finds the applicant's LRA changes and the applicant's use of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection for managing loss of material due to general, pitting, and crevice corrosion in steel components exposed to treated water in the reactor vessel top head enclosure and in the reactor coolant system pressure boundary to be acceptable.

For some components referring to LRA Table 3.1.1, item 3.1.1-11, the applicant credited the Inservice Inspection (ISI) Program in lieu of a one-time inspection program to confirm that the BWR Water Chemistry Program is effective in preventing loss of material due to corrosion. The components where the ISI Program is credited are carbon steel or unclad low alloy steel upper head components (dome, closure flange, and nozzles), and certain reactor coolant pressure boundary piping and fittings, and valve bodies greater than 4 inches nominal pipe size. For all of these components, the applicant's ISI Program requires volumetric and visual examinations. The staff reviewed the applicant's ISI Program, and the staff's evaluation of that program is documented in SER Section 3.0.3.2.1. The staff found that the ISI Program is capable of detecting loss of material for components of the reactor coolant pressure boundary, including piping, valves, and the reactor pressure vessel. On the basis that the ISI Program's examination methodology is capable of detecting loss of material in the subject components, the staff finds it acceptable for the applicant to credit the ISI Program in lieu of a one-time inspection program for confirming that the BWR Water Chemistry Program is effective in preventing loss of material due to corrosion in those components.

The staff confirmed in SRP-LR Table 3.1-1, Item 12, is only applicable to PWR plants. On the basis of its review, the staff concluded that because SSES is a BWR, SRP-LR Section 3.1.2.2.2.1 is not applicable to SSES.

(2) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in isolation condenser components. The applicant stated that this aging effect

is not applicable because SSES design does not include an isolation condenser.

SRP-LR Section 3.1.2.2.2 states that loss of material due to pitting and crevice corrosion may occur in stainless steel BWR isolation condenser components exposed to reactor coolant. Loss of material due to general, pitting, and crevice corrosion may occur in steel BWR isolation condenser components. The existing program controls reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff verified in the UFSAR, Rev. 63 that SSES is a BWR that does not have an isolation condenser.

On the basis of its review, the staff concluded that because SSES is a BWR without an isolation condenser, SRP-LR Section 3.1.2.2.2.2 is not applicable to SSES.

(3) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in flanges, nozzles, penetrations, pressure housings, safe ends, and vessel shells, heads, and welds. The applicant stated that the BWR Water Chemistry Program is supplemented by the Inservice Inspection (ISI) Program for managing loss of material due to crevice and pitting corrosion for the steel RV upper head closure flange and shell closure flange with stainless steel cladding exposed to reactor coolant. A one-time inspection is not credited. The BWR Water Chemistry Program alone is credited for managing loss of material due to crevice and pitting corrosion of the steel RV shell rings, ID attachments and welds, bottom head, nozzles, safe ends, and CRD stub tubes and housings with stainless steel cladding exposed to reactor coolant. A one-time inspection is not credited. The BWR Water Chemistry Program in association with the Small Bore Class 1 Piping Inspection or the Inservice Inspection (ISI) Program manages loss of material due to pitting and crevice corrosion for stainless steel components of the reactor coolant system (RCS) pressure boundary exposed to reactor coolant. The Small Bore Class 1 Piping Inspection is a one-time inspection.

SRP-LR Section 3.1.2.2.2 states that loss of material due to pitting and crevice corrosion may occur in stainless steel, nickel alloy, and steel with stainless steel or nickel alloy cladding flanges, nozzles, penetrations, pressure housings, safe ends, and vessel shells, heads, and welds exposed to reactor coolant. The existing program controls reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed all AMR results lines referring to LRA Table 3.1.1, items 3.1.1-14 or 3.1.1-15, and to LRA Section 3.1.2.2.2.3. The staff noted that the AMR results can be divided into four categories based upon the AMPs proposed by the applicant: 1) AMR results where loss of material is managed by the BWR Water Chemistry Program, alone; 2) AMR results where loss of material is managed by a combination of the BWR Water Chemistry Program and the Small Bore Class 1 Piping Inspection; 3) AMR results where loss of material is managed by a combination of the BWR Water Chemistry Program and the ASME Code Section XI Inservice Inspection (IWB, IWC, and IWD) program; and 4) AMR results where loss of material is managed by a combination of the BWR Water Chemistry Program and the BWR Vessel Internals Program. For AMR results in the first, third and fourth category, the applicant cited generic note E indicating that the material, environment and aging effect are consistent with the GALL Report but a different aging management program is credited. For AMR results in the second category, BWR Water Chemistry Program and Small Bore Class 1 Piping Inspection, the applicant cited generic note A indicating that the component, material, environment, aging effect, and AMP are all consistent with the GALL Report.

As a result of its review of the applicant AMP B.2.31, Small Bore Class 1 Piping Inspection, and the applicant's AMR results, the staff issued requests for additional information in letters dated June 23, 2008, and July 15, 2008:

- RAI B.2.31-1 asked the applicant to reconcile inconsistencies related to the applicant's claim that the Small Bore Class 1 Piping Inspection is consistent with GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small Bore Piping."

- RAI 3.1-1 asked the applicant to justify how the BWR Water Chemistry Program, alone, would provide adequate aging management for loss of material for those AMR results where no inspection was specified to confirm effectiveness of the water chemistry program.

The applicant responded to RAI B.2.31-1 in a letter dated July 25, 2008, and to RAI 3.1-1 in a letter dated August 15, 2008. In those responses, the applicant revised all of the AMR results that referred to LRA Table 3.1.1, items 3.1.1-14 or 3.1.1-15, where the aging effect was managed either by the BWR Water Chemistry Program or by the BWR Water Chemistry Program in combination with the Small Bore Class 1 Piping Inspection. In the revised AMR results, the applicant proposes to manage loss of material for stainless steel, nickel alloy, and steel with stainless steel or nickel-alloy clad components exposed to treated water with a combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection. The staff finds that use of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection is consistent with recommendations in the GALL Report.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the applicant's BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to pitting and crevice corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the applicant's Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the

GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The applicant's Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to pitting and crevice corrosion, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection for loss of material due to pitting, and crevice corrosion, the staff finds the applicant's LRA changes and the applicant's use of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection for managing loss of material due to pitting, and crevice corrosion for stainless steel, nickel alloy, and steel with stainless steel or nickel-alloy clad components exposed to treated water in the reactor pressure vessel and in the reactor coolant system pressure boundary to be acceptable.

For some components referring to LRA Table 3.1.1, items 3.1.1-14 and 3.1.1-15, the applicant credited the Inservice Inspection (ISI) Program in lieu of a one-time inspection program to confirm that the BWR Water Chemistry Program is effective in preventing loss of material due to pitting or crevice corrosion. The components where the ISI Program is credited are stainless steel clad reactor vessel and upper head closure flanges, stainless steel pump casings and covers, piping and valve bodies greater than 4 inch nominal pipe size and tubing, and steam line flow restrictors. For all of these components, the applicant's ISI Program requires volumetric and visual examinations (except tubing where only visual examination is required). The staff reviewed the applicant's ISI Program, and the staff's evaluation of that program is documented in SER Section 3.0.3.2.1. The staff found that the ISI Program is capable of detecting loss of material for components of the reactor coolant pressure boundary, including piping, tubing, pump casings, valves, flow restrictors, and the reactor pressure vessel. On the basis that the ISI Program's examination methodology is capable of detecting loss of material in the subject components, the staff finds it acceptable for the applicant to credit the ISI Program in lieu of a one-time inspection program for confirming that the BWR Water Chemistry Program is effective in preventing loss of material due to corrosion in those components.

For vessel internal components referring to LRA Table 3.1.1, item 3.3.1-14, the applicant credited the BWR Vessel Internals Program in lieu of a one-time inspection program to confirm that the BWR Water Chemistry Program is effective in preventing loss of material due to pitting and crevice corrosion. The staff reviewed the applicant's BWR Vessel Internals Program, and the staff's evaluation is documented in SER Section 3.0.3.2.4. The staff found that the BWR Vessel Internals Program is capable of detecting loss of material due to pitting and crevice corrosion for stainless steel or nickel alloy components that are within its scope. On the basis that the BWR Vessel Internals Program is capable of detecting loss of material in the subject components, the staff finds it acceptable for the applicant to credit the BWR Vessel Internals Program in lieu of a one-time inspection program for confirming that the BWR Water Chemistry Program is effective in preventing loss of material due to pitting and crevice corrosion in stainless steel or nickel alloy reactor vessel internals.

(4) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in PWR steam generator upper and lower shell and transition cone. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam.

The staff confirmed in SRP-LR Table 3.1-1, Item 16, is only applicable to PWR plants.

On the basis of its review, the staff concluded that because SSES is a BWR, SRP-LR Section 3.1.2.2.2.4 is not applicable to SSES.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.2 criteria. For those line items that apply to LRA Section 3.1.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

The staff reviewed LRA Section 3.1.2.2.3 against the following criteria in SRP-LR Section 3.1.2.2.3:

(1) LRA Section 3.1.2.2.3 states that neutron irradiation embrittlement is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.2 documents the staff's review of the applicant's evaluation of this TLAA.

(2) LRA Section 3.1.2.2.3 addresses loss of fracture toughness due to neutron irradiation embrittlement in RV beltline shell, nozzle, and welds. The applicant stated that reduction in fracture toughness due to radiation embrittlement could occur for RV beltline region materials exposed to reactor coolant and neutron flux. A RV materials surveillance program monitors radiation embrittlement of the steel RV beltline materials with stainless steel cladding. The Reactor Vessel Surveillance Program, and the results of its evaluation for license renewal, are presented in Appendix B of the LRA.

    SRP-LR Section 3.1.2.2.3 states that loss of fracture toughness due to neutron irradiation embrittlement may occur in BWR and PWR RV beltline shell, nozzle, and welds exposed to reactor coolant and neutron flux. A RV materials surveillance program monitors neutron irradiation embrittlement of the RV. Reactor vessel surveillance programs are plant-specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Untested capsules placed in storage must be maintained for future insertion. Thus, further staff evaluation is required for license renewal. Specific recommendations for an acceptable AMP are provided in GALL Report Chapter XI, Section M31.

LRA Section 3.1.2.2.3.1 provides the applicant's discussion on management of neutron irradiation embrittlement TLAA. The applicant states that, "Certain aspects of neutron irradiation embrittlement are time-limited aging analyses (TLAAs) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4.2 of the LRA.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.3 criteria. For those line items that apply to LRA Section 3.1.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.4 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.4 against the following criteria in SRP-LR Section 3.1.2.2.4:

(1) LRA Section 3.1.2.2.4 addresses cracking due to SCC and IGSCC in BWR top head enclosure vessel flange leak detection lines. The applicant stated that the RV flange leak detection line at SSES is a Class 1 line that is normally dry. The stainless steel line is evaluated for a treated water environment and is therefore susceptible to cracking due to SCC. This aging effect is managed with a combination of the BWR Water Chemistry Program and the Small Bore Class 1 Piping Inspection.

SRP-LR Section 3.1.2.2.4 states that cracking due to SCC and IGSCC may occur in the stainless steel and nickel alloy BWR top head enclosure vessel flange leak detection lines. The GALL Report recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting cracking due to SCC and IGSCC.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the applicant's BWR Water Chemistry Program provides mitigation for the aging effect of cracking caused by SSC or IGSCC in stainless steel piping exposed to treated water. The staff reviewed the applicant's Small Bore Class 1 Piping Inspection program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the applicant's Small Bore Class 1 Piping Inspection program provides for a one-time examination of ASME Code Class 1 small bore piping using volumetric examination techniques that are capable of detecting piping cracks caused by SCC or IGSCC. Based on the staff's determination that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking due to SCC or IGSCC, and the Small Bore Class 1 Piping Inspection program provides detection of potential cracking due to SCC or IGSCC, the staff finds the applicant's proposed AMPs for managing the aging effect of cracking in the stainless steel flange leak detection lines to be acceptable.

(2) LRA Section 3.1.2.2.4 addresses cracking due to SCC and IGSCC in isolation condenser components. The applicant stated that this aging effect is not applicable because SSES design does not include an isolation condenser.

SRP-LR Section 3.1.2.2.4 states that cracking due to SCC and IGSCC may occur in stainless steel BWR isolation condenser components exposed to reactor coolant. The existing program controls reactor water chemistry to mitigate SCC and relies on ASME Code Section XI ISI; however, the existing program should be augmented to detect cracking due to SCC and IGSCC. The GALL Report recommends an augmented program to include temperature and radioactivity monitoring of the shell-side water and eddy current testing of tubes to ensure that component intended functions will be maintained during the period of extended operation.

SRP-LR Section 3.1.2.2.4.2 invokes the AMR Item 20 in Table 1 of the GALL Report, Volume 1 and AMR Item IV.C1-4 of the GALL Report, Volume 2 on management of cracking due to SCC and IGSCC in stainless steel BWR isolation condenser components that are exposed to the treated water environment of the reactor coolant.

The staff reviewed the UFSAR for SSES. The staff determined that the UFSAR Chapter 6 indicates that, at SSES, each of the SSES units use a reactor core isolation cooling (RCIC) system as the system for isolating the reactor from the main steam system during operational transients and during postulated design basis accidents. The staff verified that the units do not include isolation condensers. Based on this review, the staff concludes that the recommendations in SRP-LR Section 3.1.2.2.4.2 and in GALL AMR IV.C1-4 are not applicable to the SSES LRA, because the SSES plant designs does not include isolation condenser systems.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.4 criteria. For those line items that apply to LRA Section 3.1.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.5 Crack Growth Due to Cyclic Loading

LRA Section 3.1.2.2.5 addresses crack growth due to cyclic loading. The applicant stated that this aging effect is not applicable because SSES is a BWR.

The staff reviewed LRA Section 3.1.2.2.5 against the criteria in SRP-LR Section 3.1.2.2.5 which states that crack growth due to cyclic loading can occur in the reactor vessel shell forgings clad with stainless steel using a high-heat-input welding process.

The staff confirmed in SRP-LR Table 3.1-1, Item 21, is only applicable to PWR plants.

On the basis of its review, the staff concluded that because SSES is a BWR, SRP-LR Section 3.1.2.2.5 is not applicable to SSES.

3.1.2.2.6 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement and Void Swelling

The staff reviewed LRA Section 3.1.2.2.6 against the criteria in SRP-LR Section 3.1.2.2.6.

LRA Section 3.1.2.2.6 addresses loss of fracture toughness due to neutron irradiation embrittlement and void swelling. The applicant stated that this aging effect is not applicable because SSES is a BWR.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.6 criteria is not applicable.

3.1.2.2.7 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.7 against the following criteria in SRP-LR Section 3.1.2.2.7:

(1) LRA Section 3.1.2.2.7 addresses cracking due to SCC in PWR stainless steel RV flange leak detection lines and bottom-mounted instrument guide tubes exposed to reactor coolant. The applicant stated that this aging effect is not applicable because SSES is a BWR.

    SRP-LR Section 3.1.2.2.7 states that cracking due to SCC may occur in the PWR stainless steel RV flange leak detection lines and bottom-mounted instrument guide tubes exposed to reactor coolant.

    The staff reviewed the UFSAR for SSES. The staff determined that the UFSAR Chapter 1 indicates that the SSES reactors are General Electrical (GE) Model 4 BWRs with Mark II containment structures. Based on this review, the staff concludes that the recommendations in SRP-LR Section 3.1.2.2.7.1 are not applicable to the SSES LRA, because the SSES plants are not PWR designed reactors.

    The staff confirmed in SRP-LR Table 3.1-1, Item 23, is only applicable to PWR plants. Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.7.1 does not apply to SSES.

(2) LRA Section 3.1.2.2.7 addresses cracking due to SCC in Class 1 PWR cast austenitic stainless steel (CASS) reactor coolant system piping, piping components, and piping elements exposed to reactor coolant. The applicant stated that this aging effect is not applicable because SSES is a BWR.

    SRP-LR Section 3.1.2.2.7 states that cracking due to SCC may occur in Class 1 PWR cast austenitic stainless steel (CASS) reactor coolant system piping, piping components, and piping elements exposed to reactor coolant.

    The staff reviewed the UFSAR for SSES. The staff determined that the UFSAR Chapter 1 indicates that the SSES reactors are General Electrical (GE) Model 4 BWRs with Mark II containment structures. Based on this review, the staff concludes that the recommendations in SRP-LR Section 3.1.2.2.7.2 are not applicable to the SSES LRA, because the SSES plants are not PWR designed reactors.

    The staff confirmed in SRP-LR Table 3.1-1, Item 24, is only applicable to PWR plants. Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.7.2 does not apply to SSES.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.7 criteria is not applicable.

3.1.2.2.8 Cracking Due to Cyclic Loading

The staff reviewed LRA Section 3.1.2.2.8 against the following criteria in SRP-LR Section 3.1.2.2.8:

(1) LRA Section 3.1.2.2.8 addresses cracking due to cyclic loading in stainless steel BWR jet pump sensing lines. The applicant stated that for SSES, the jet pump instrumentation lines inside the vessel are not subject to aging management review, as they do not

perform an intended function. The lines outside of the vessel are part of the RCS pressure boundary and are subject to aging management review for a reactor coolant environment. Cracking of the stainless steel lines external to the vessel is managed with a combination of the BWR Water Chemistry Program and the Small Bore Class 1 Piping Inspection.

SRP-LR Section 3.1.2.2.8 states that cracking due to cyclic loading may occur in the stainless steel BWR jet pump sensing lines. The GALL Report recommends that a plant-specific AMP be evaluated to ensure that this aging effect is adequately managed.

The staff reviewed the applicant's statement that the jet pump sensing lines inside the reactor vessel are not subject to AMR. The staff noted that the jet pump sensing lines inside the vessel are not part of the reactor coolant pressure boundary and that the function of the jet pump sensing lines is to provide indication of jet pump flow, which is not a license renewal intended function. Since the jet pump sensing lines inside the reactor vessel are not part of the reactor coolant pressure boundary and are not required to support a license renewal intended function, the staff finds the applicant's statement that jet pump sensing lines inside the reactor vessel are not subject to AMR to be acceptable.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the applicant's BWR Water Chemistry Program provides mitigation for the aging effect of cracking caused by SSC in stainless steel piping exposed to treated water. The staff reviewed the applicant's Small Bore Class 1 Piping Inspection program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the applicant's Small Bore Class 1 Piping Inspection program provides for a one-time examination of ASME Code Class 1 small bore piping using volumetric examination techniques that are capable of detecting piping cracks caused by SCC, IGSCC or cyclic loading. Based on the staff's determination that the BWR Water Chemistry Program provides mitigation for potential cracking and the Small Bore Class 1 Piping Inspection program provides detection of cracks due to SCC, IGSCC or cyclic loading, should they occur, the staff finds the applicant's proposed AMPs for managing the potential aging effect of cracking in the stainless steel jet pump sensing lines outside the reactor vessel to be acceptable.

(2) LRA Section 3.1.2.2.8 addresses cracking due to cyclic loading in isolation condenser components. The applicant stated that this aging effect is not applicable because SSES design does not include an isolation condenser.

SRP-LR Section 3.1.2.2.8 states that cracking due to cyclic loading may occur in steel and stainless steel BWR isolation condenser components exposed to reactor coolant. The existing program relies on ASME Code Section XI ISI; however, the existing program should be augmented to detect cracking due to cyclic loading. The GALL Report recommends an augmented program to include temperature and radioactivity monitoring of the shell-side water and eddy current testing of tubes to ensure that component intended functions will be maintained during the period of extended operation.

SRP-LR Section 3.1.2.2.8.2 invokes the AMR Item 26 in Table 1 of the GALL Report, Volume 1 and AMR Item IV.C1-5 of the GALL Report, Volume 2 on management of cracking due to cyclical loading in steel and stainless steel BWR isolation condenser components that are exposed to the treated water environment of the reactor coolant.

The staff reviewed the UFSAR for SSES. The staff determined that the UFSAR Chapter 6 indicates that, at SSES, each of the SSES units use a reactor core isolation cooling (RCIC) system as the system for isolating the reactor from the main steam system during operational transients and during postulated design basis accidents. The staff verified that the units do not include isolation condensers. Based on this review, the staff concludes that the recommendations in SRP-LR Section 3.1.2.2.8.2 and in GALL AMR IV.C1-5 are not applicable to the SSES LRA because the SSES plant designs do not include isolation condenser systems.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.8 criteria. For those line items that apply to LRA Section 3.1.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.9 Loss of Preload Due to Stress Relaxation

The staff reviewed LRA Section 3.1.2.2.9 against the criteria in SRP-LR Section 3.1.2.2.9.

LRA Section 3.1.2.2.9 addresses loss of preload due to stress relaxation. The applicant stated that this aging effect is not applicable because SSES is a BWR.

The staff reviewed the UFSAR for SSES. The staff determined that the UFSAR Chapter 1 indicates that the SSES reactors are General Electrical (GE) Model 4 BWRs with Mark II containment structures. Based on this review, the staff concludes that the recommendations in SRP-LR Section 3.1.2.2.9 are not applicable to the SSES LRA because the SSES plants are not PWR designed reactors.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.9 criteria is not applicable.

3.1.2.2.10 Loss of Material Due to Erosion

The staff reviewed LRA Section 3.1.2.2.10 against the criteria in SRP-LR Section 3.1.2.2.10.

LRA Section 3.1.2.2.10 addresses loss of material due to erosion in steam generators. The applicant stated that this aging effect is not applicable because SSES is a BWR.

Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.10 does not apply to SSES.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.1.2.2.10 criteria is not applicable.

3.1.2.2.11 Cracking Due to Flow-Induced Vibration

The staff reviewed LRA Section 3.1.2.2.11 against the criteria in SRP-LR Section 3.1.2.2.11.

LRA Section 3.1.2.2.11 addresses cracking due to flow-induced vibration. The applicant stated that cracking due to flow-induced vibration for SSES stainless steel steam dryers exposed to reactor coolant is managed by a combination of the BWR Vessel Internals Program and the BWR Water Chemistry 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.

SRP-LR Section 3.1.2.2.11 invokes the AMR Item 29 in Table 1 of the GALL Report, Volume 1 and AMR IV.B1-16 in the GALL Report, Volume 2 on management of cracking due to flow-induced vibration stainless steel BWR steam dryers.

The staff reviewed the information in LRA Section 3.1.2.2.11 and in LRA Table 3.1.2-2 against the staff's recommended AMR guidance in SRP-LR Section 3.1.2.2.11 and in GALL AMR IV.B1-16. The staff verified that in LRA Table 3.1.2-2, the applicant has included an AMR that aligns to GALL AMR IV.B1-16, and that in the AMR, the applicant credits a combination Water Chemistry Program and BWR Vessel Internals Program to manage cracking of the steam dryers that is induced by flow-induced vibration.

The staff noted that the aging mechanism of concern is a high cycle fatigue mechanism and that this mechanism is not dependent on the concentrations of chemical impurities that could lead to corrosive type of cracking, such stress corrosion cracking (SCC, including intergranular stress corrosion cracking [IGSCC], primary water stress corrosion cracking [PWSCC]) and intergranular attack (IGA).

Thus, the staff noted that the applicant's crediting of the Water Chemistry Program did not create a valid basis for aging management of cracking due to flow-induced vibrations because flow-induced vibrations are a high-cycle fatigue phenomenon and are not dependent on the control of water chemistry impurity concentrations.

The staff also noted that the applicant credited its BWR Vessel Internals Program (LRA AMP B.2.9) for aging management and that the applicant's program is identified as a program that is consistent with the recommended program elements of GALL AMP XI.M9, "BWR Vessel Internals," with an enhancement to perform augmented inspections of the SSES top guide grid beam and beam-to-beam crevice slots. The staff reviewed GALL AMP XI.M9 and confirmed that, although the BWRVIP has submitted a number of BWRVIP topical reports on evaluation of flow-induced vibrations in BWR steam dryers and on inspection of BWR steam dyers and management of cracking that may result in BWR steam dryers as a result of flow-induced vibrations, none of the BWRVIP reports on BWR steam dryer flow induced vibrations and cracking have been approved to date or endorsed in GALL AMP XI.M9, "BWR Vessel Internals." Thus the staff was of the opinion that the applicant's BWR Vessel Internals Program, in its current form, did not provide a valid basis for managing cracking due to flow-induced vibrations in the steam dryers because the applicant's program does not currently include any enhancements and commitments to: (1) of perform flow-induced vibration high cycle fatigue flaw growth calculations of the steam dryers, (2) establish the flaw evaluation and corrective action recommendations on postulated steam dryer cracking, and (3) establish the augmented inspection recommendations for the steam dryers (including the inspection methods and frequency for the examinations to be performed).

In RAI 3.1.2.2.11-1 by letter dated July 23, 2008, the staff asked the applicant to justify its selection of the Water Chemistry Program and the BWR Vessel Internals Program for aging management of cracking due to flow-induced vibrations of the steam dryers.

In its letter dated August 27, 2008, in response to RAI 3.1.2.2.11-1, the applicant stated that the BWR Water Chemistry Program does not manage cracking due to flow-induced vibration. The applicant revised the LRA to delete the BWR Water Chemistry Program from the line entry for cracking of the steam dryers in LRA Table 3.1.2-2. The applicant stated the following for crediting the BWR Vessel Internals Program to manage cracking of the steam dryers:

> The technical basis for crediting the BWR Vessel Internals Program (BWRVIP) for management of cracking due to flow-induced vibration in the steam dryers is that the BWRVIP incorporates the best industry guidance that is currently available from BWRVIP reports BWRVIP- 139, BWRVIP- 181, and BWRVIP- 182.
>
> PPL will follow Section 6 of BWRVIP-139 when evaluating cracking in the steam dryer. PPL has instrumented the newly designed steam dryer in Unit 1 to obtain data on the actual stresses in the dryer during current licensed power at extended power uprate (EPU) conditions. Based on the measured stresses, PPL will perform a flow-induced vibrational analysis. If any fatigue flaws are identified during the BWRVIP-required inspections, PPL can accurately calculate flaw growth and establish re-inspection intervals.
>
> Currently, there is no regulatory basis for management of cracking due to flow-induced vibration in the steam dryers. GALL line item IV.B 1-16 recommends a plant-specific program, which, in effect, acknowledges that there is no generically accepted or approved program for management of flow-induced vibration of the steam dryers. However, since the BWRVIP includes provisions to incorporate all approved BWRVIP documents, or to file notice of exception, the program requires its own modification if the NRC requires changes to BWRVIP- 139, BWRVIP- 181, and BWRVIP- 182 prior to their approval. Consequently, there is no need to enhance AMP B.2.9, the BWR Vessel Internals Program, at this time.

The staff reviewed the applicant response and noted that the applicant proposes to use BWRVIP-139, Steam Dryer Inspection and Flaw Evaluation Guidelines, to manage the aging effect of cracking in the steam dryers. The staff issued its safety evaluation on BWRVIP-139 in a letter to the BWRVIP dated July 30, 2008. For re-inspection, the staff stated that the guidelines below should be followed:

- Each BWR licensee will determine the appropriate re-inspection approach according to GE SIL-644 or BWRVIP-139 in consideration of the steam dryer performance at its plant.
- License conditions associated with steam dryer monitoring programs in power uprate license amendments take precedence over the steam dryer re-inspection provisions in GE SIL-644 or BWRVIP-139.
- The licensee will justify any adjustments to its steam dryer re-inspection program where commitments exist to implement the re-inspection provisions in GE SIL-644 to support a power uprate license amendment or other activities.
- The licensee is expected to inform the NRC staff of significant changes to its steam dryer re-inspection program where the staff relied on the program in a regulatory decision.

The staff finds the deletion of the Water Chemistry Program to be acceptable because flow-induced vibrations are a high-cycle fatigue phenomenon and are not dependent on the control of water chemistry impurity concentrations.

The staff noted that the applicant has instrumented the dryer to obtain data on actual stresses during extended power uprate conditions. Based on this data, the applicant plans to perform a flow-induced vibrational analysis. The staff concludes that the applicant is implementing the guidelines of BWRVIP-139 as accepted by the staff in its SE and on the basis that the applicant's BWR Vessel Internals Program includes provisions to incorporate all approved BWRVIP documents, and the BWR Vessel Internals Program has incorporated the guidelines of BWRVIP-139, the staff finds the applicant response acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.11 criteria. For those line items that apply to LRA Section 3.1.2.2.11, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 Cracking Due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.12 against the criteria in SRP-LR Section 3.1.2.2.12.

LRA Section 3.1.2.2.12 addresses cracking due to SCC and IASCC. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.12 states that cracking due to SCC and IASCC may occur in PWR stainless steel reactor internals exposed to reactor coolant.

The staff confirmed in SRP-LR Table 3.1-1, Item 20, is only applicable to PWR plants.

Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.12 does not apply to SSES.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.12 criteria is not applicable.

3.1.2.2.13 Cracking Due to Primary Water Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.13 against the criteria in SRP-LR Section 3.1.2.2.13.

LRA Section 3.1.2.2.13 addresses cracking due to primary water SCC (PWSCC). The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.13 states that cracking due to primary water SCC (PWSCC) may occur in PWR components made of nickel alloy and steel with nickel alloy cladding, including RCPB components and penetrations inside the reactor coolant system such as pressurizer heater sheathes and sleeves, nozzles, and other internal components.

The staff confirmed in SRP-LR Table 3.1-1, Item 31, is only applicable to PWR plants.

Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.13 does not apply to SSES.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.13 criteria is not applicable.

3.1.2.2.14 Wall Thinning Due to Flow-Accelerated Corrosion

The staff reviewed LRA Section 3.1.2.2.14 against the criteria in SRP-LR Section 3.1.2.2.14.

LRA Section 3.1.2.2.14 addresses wall thinning due to FAC in steam generators. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.14 states that wall thinning due to FAC may occur in steel FW inlet rings and supports.

The staff confirmed in SRP-LR Table 3.1-1, Item 32, is only applicable to PWR plants.

Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.14 does not apply to SSES.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.14 criteria is not applicable.

3.1.2.2.15 Changes in Dimensions Due to Void Swelling

The staff reviewed LRA Section 3.1.2.2.15 against the criteria in SRP-LR Section 3.1.2.2.15.

LRA Section 3.1.2.2.15 addresses changes in dimension due to void swelling. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.15 states that changes in dimensions due to void swelling may occur in stainless steel and nickel alloy PWR internal components exposed to reactor coolant.

The staff confirmed in SRP-LR Table 3.1-1, Item 33, is only applicable to PWR plants.

Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.15 does not apply to SSES.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.15 criteria is not applicable.

3.1.2.2.16 Cracking Due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.16 against the following criteria in SRP-LR Section 3.1.2.2.16:

(1) LRA Section 3.1.2.2.16 addresses cracking due to SCC and primary water SCC on the primary coolant side of PWR steel steam generator upper and lower heads, tubesheets,

and tube-to-tube sheet welds made or clad with stainless steel. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.16 states that cracking due to SCC may occur on the primary coolant side of PWR steel steam generator upper and lower heads, tubesheets, and tube-to-tube sheet welds made or clad with stainless steel. Cracking due to PWSCC may occur on the primary coolant side of PWR steel steam generator upper and lower heads, tubesheets, and tube-to-tube sheet welds made or clad with nickel alloy.

The staff reviewed the UFSAR for SSES. The staff determined that the UFSAR Chapter 1 indicates that the SSES reactors are General Electrical (GE) Model 4 BWRs with Mark II containment structures. Based on this review, the staff concludes that the recommendations in SRP-LR Section 3.1.2.2.16.1 are not applicable to the SSES LRA because the SSES plants are not PWR designed reactors.

The staff confirmed in SRP-LR Table 3.1-1, Item 34 and Item 35, is only applicable to PWR plants. Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.16.1 does not apply to SSES.

(2) LRA Section 3.1.2.2.16 addresses cracking due to SCC and primary water SCC on stainless steel pressurizer spray heads. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.16 states that cracking due to SCC may occur on stainless steel pressurizer spray heads. Cracking due to PWSCC may occur on nickel-alloy pressurizer spray heads.

The staff reviewed the UFSAR for SSES. The staff determined that the UFSAR Chapter 1 indicates that the SSES reactors are General Electrical (GE) Model 4 BWRs with Mark II containment structures. Based on this review, the staff concludes that the recommendations in SRP-LR Section 3.1.2.2.16.2 are not applicable to the SSES LRA because the SSES plants are not PWR designed reactors.

The staff confirmed in SRP-LR Table 3.1-1, Item 36, is only applicable to PWR plants. Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.16.2 does not apply to SSES.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.16 criteria are not applicable.

3.1.2.2.17 Cracking Due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.17 against the criteria in SRP-LR Section 3.1.2.2.17.

LRA Section 3.1.2.2.17 addresses cracking due to SCC, primary water SCC, and irradiation-assisted SCC. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.1.2.2.17 states that cracking due to SCC, PWSCC, and IASCC may occur in PWR stainless steel and nickel alloy RV internals components.

The staff confirmed in SRP-LR Table 3.1-1, Item 37, is only applicable to PWR plants. Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.1.2.2.17 does not apply to SSES.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.17 criteria are not applicable.

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.1.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.1.2-1 through 3.1.2-3, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.1.2-1 through 3.1.2-3, the applicant indicated, via notes F through J, which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.1.2.3.1 Aging Management Review Results - Reactor Pressure Vessel – LRA Table 3.1.2-1

The staff reviewed LRA Table 3.1.2-1, which summarizes the results of AMR evaluations for the reactor pressure vessel component groups.

LRA Table 3.1.2-1 summarizes the results of AMRs for the Reactor Pressure Vessel low alloy steel, nickel based alloy, and low alloy steel clad with stainless steel, exposed to indoor air (external) for the reactor vessel upper head closure flange, safe ends, nozzles, reactor vessel bottom head flanges, reactor vessel shell rings, reactor vessel closure flange, and reactor vessel upper head (dome). The applicant proposed no aging effect for this material/environment combination and stated that no AMR is required.

The applicant assigned note G for this material/environment combination. Note G states, "Environment not in NUREG-1801 for this component and environment combination."

During the staff's review, the staff pointed out that the low alloy steel is at high temperature during operation preventing the accumulation of moisture and therefore, insignificant corrosion will occur during this time period. The staff also pointed out that the only time that corrosion could occur is during outages, and these would not be of sufficient duration to result in significant corrosion.

During the staff's review, the staff pointed out that Stainless steels and nickel alloys 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 intended functions consistent with the CLB for the period of extended operation.

The staff concludes that there are no aging effects requiring management for these components because of the dry environment for low alloy steel and no aging effect for the nickel alloys or stainless steel cladding and stainless steel components in the Reactor Vessel, Reactor Vessel Internals and Reactor Coolant System components within the scope of license renewal

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).

In LRA Table 3.1.2-1, the applicant proposed to manage cracking due to stress corrosion cracking (SCC) in stainless steel cladding for low alloy steel in an environment of treated water using the BWR Water Chemistry Program, alone. The applicant cited generic note H for these AMR results, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. The staff noted that the BWR Water Chemistry Program does not include an inspection activity to confirm effectiveness of the program to mitigate the aging effect and issued RAI 3.1-8 by letter dated July 15, 2008, asking the applicant why a confirmatory AMP, such as the Water Chemistry Effectiveness Inspection, is not needed for these components.

In a letter dated August 15, 2008, the applicant responded to RAI 3.1-8 by providing the following response:

> The LRA Table 3.1.2-1 is revised to credit the Chemistry Program Effectiveness Inspection in addition to the BWR Water Chemistry Program for AMR result lines addressing stainless steel cladding in treated water with an aging effect of "cracking – SCC (cladding)."

The staff reviewed the applicant's response and the associated LRA changes. The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking caused by SSC in stainless steel clad components exposed to treated water. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes examination methods that are capable of detecting cracking due to SCC. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection for cracking due to SCC, the staff finds the applicant's LRA changes and the applicant's use of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection for managing cracking due to SCC in the cladding of stainless steel clad components exposed to treated water in the reactor pressure vessel to be acceptable.

In LRA Table 3.1.2-1, the applicant includes its plant-specific AMRs on management of cracking – flaw growth in steel (carbon steel or alloy steel) reactor vessel (RV) components that are unclad or have internal stainless steel or Nickel-alloy cladding under internal exposure to the treated water environment of the reactor coolant:

- RV upper heads, closure flanges, shells, and bottom heads
- RV recirculation inlet nozzles, recirculation outlet nozzles, core spray nozzles, jet pump instrumentation nozzles,
- RV main steam line nozzles and their safe ends,
- RV head spray and spare nozzles, RV head vent nozzles, and their flanges
- RV feedwater nozzle safe ends, and RV N11, N12, and N16 instrumentation nozzle safe ends

In these AMRs, the applicant identifies that cracking/flaw growth is an applicable aging effect requiring management (AERM) for the internal component surfaces that are exposed to the reactor coolant. In these AMRs, the applicant credits its Inservice Inspection Program with management of cracking/flaw growth in the components.

The staff determined that the applicant conservatively identified cracking/flaw growth as an applicable AERM for the internal component surfaces that are exposed to the treated water environment of the reactor coolant. The staff noted that the applicant's aging effect cracking/flaw growth corresponds to the phrase "crack initiation and growth" in the definition for cracking that is provided in GALL Table IX.E. Based on this determination, the staff finds that the applicant has conformed to the guidance for cracking in GALL Table IX.E.

The staff also determined that the applicant has credited AMP B.2.1, Inservice Inspection Program as the basis for managing cracking/flaw growth in the internal component surfaces that are exposed to the treated water environment of the reactor coolant. The staff verified for the RV components assessed in this section that the Inservice Inspection Program requires the applicant to perform volumetric examinations of these components in accordance with the applicable volumetric and surface examination requirements in the ASME Code Section XI Examination Categories B-A, B-D, or B-F, as invoked by 10 CFR 50.55a. The required volumetric examinations use techniques (such as ultrasonic testing or radiography) that are capable of detecting cracks or imperfections throughout the thickness of the components. Thus, the inspections required by these examination categories are sufficient to detect and monitor for crack initiation and growth that may be occurring in these RV components. On this basis, the staff finds that the applicant has provided an acceptable basis for crediting the Inservice Inspection Program for aging management of cracking/flaw growth in these components as a result of exposure to the treated water environment of the reactor coolant.

Based on this review, the staff also concludes the applicant has provided an acceptable basis that demonstrates that the volumetric examinations performed under the Inservice Inspection

Program will be capable of detecting and monitoring for cracking/flaw growth in these RV components. The staff's evaluation of the ability of the Inservice Inspection Program to manage cracking in AMSE Code Class components is given in SER Section 3.0.3.2.1.

In LRA Table 3.1.2-1, the applicant includes its plant-specific AMR on management of cracking – flaw growth in the alloy steel reactor vessel stabilizer brackets that are exposed externally to an indoor air environment. In this AMR, the applicant identifies that cracking/flaw growth is an applicable aging effect requiring management (AERM) for the external component surfaces that are exposed to the indoor air environment. In this AMR, the applicant credits its Inservice Inspection Program with management of cracking/flaw growth in the external component surfaces.

The staff determined that the applicant conservatively identified cracking/flaw growth as an applicable AERM for the external RV stabilizer bracket surfaces that are exposed to indoor air. The staff noted that the applicant's aging effect cracking/flaw growth corresponds to the phrase "crack initiation and growth" in the definition for cracking that is provided in GALL Table IX.E. Based on this determination, the staff finds that the applicant has conformed to the guidance for cracking in GALL Table IX.E.

The staff also determined that the applicant has credited AMP B.2.1, Inservice Inspection Program as the basis for managing cracking/flaw growth in the RV stabilizer bracket surfaces that are exposed externally to indoor air. The staff verified that, for the RV stabilizer brackets assessed in this section, the Inservice Inspection Program requires that the applicant to perform surface examinations of these components in accordance with the applicable volumetric and surface examination requirements in the ASME Code Section XI Examination Category B-K, as invoked by 10 CFR 50.55a. The required volumetric examinations use techniques (penetrant testing [PT] or magnetic particle test [MT]) that are capable of detecting potential cracks that penetrate the external surfaces of the stabilizer bracket welds. Thus, the inspections required by this ASME Code Section XI examination category are sufficient to detect and monitor for crack initiation and growth that may be occurring in the externals surfaces of the RV stabilizer brackets. On this basis, the staff finds that the applicant has provided an acceptable basis for crediting the Inservice Inspection Program for aging management of cracking/flaw growth in these components as a result of exposure to indoor air.

Based on this review, the staff also concludes that the Inservice Inspection Program is acceptable for management of the applicable AERMs because the applicant has provided an acceptable basis that demonstrates that the surface examinations performed under the Inservice Inspection Program will be capable of detecting and monitoring for cracking/flaw growth in the external RV stabilizer bracket surfaces that are exposed to indoor air. The staff's evaluation of the ability of the Inservice Inspection Program to manage cracking in AMSE Code Class components is given in SER Section 3.0.3.2.1.

In LRA Table 3.1.2-1, the applicant includes its plant-specific AMR on management of cracking – flaw growth in the Nickel-alloy N9 CRD nozzle cap that is exposed internally to the treated water environment of the reactor coolant. In this AMR, the applicant identifies that cracking/flaw growth is an applicable aging effect requiring management (AERM) for the internal component surfaces that are exposed to the reactor coolant. In this AMR, the applicant credits its BWR CRD Return Line Program with management of cracking/flaw growth in the internal component surfaces.

The staff determined that the applicant conservatively identified cracking/flaw growth as an applicable AERM for the internal CRD return line nozzle cap surfaces that are exposed to the reactor coolant. The staff noted that the applicant's aging effect cracking/flaw growth corresponds to the phrase "crack initiation and growth" in the definition for cracking that is provided in GALL Table IX.E. Based on this determination, the staff finds that the applicant met the guidance in SRP-LR 3.1.3.3 for identifying the applicable aging effects for these nozzle cap surfaces because the applicant has conformed to the guidance for cracking in GALL Table IX.E.

The staff also determined that the applicant has credited AMP B.2.6, BWR CRD Return Line Nozzle Program as the basis for managing cracking/flaw growth in the internal surfaces of the CRD return line nozzle caps and their associated cap-to-nozzle circumferential welds that are exposed to the reactor coolant. The staff verified that, for these nozzle caps, the applicant's BWR CRD Return Line Nozzle Program is a program that is designed to manage cracking in the CRD return lines nozzles and that the AMP is consistent with the staff's recommended program elements for CRD return line nozzles in GALL AMP XI.M6, "CRD Return Line Nozzle," with an exception to perform weld overlay methods for repairs of existing cracks in the nozzles. The staff also verified that the scope of the AMP includes potential capping of the nozzles and their associated cap-to-nozzle circumferential welds. The staff evaluates the ability of the BWR CRD Return Line Nozzle Program to manage cracking in these components in SER Section 3.0.3.2.2. The staff evaluation includes an evaluation on the ability of the BWR CRD Return Line Nozzle Program to manage cracking in the CRD return line nozzle cap cap-to-nozzle circumferential welds and the exception to use weld overlay methods for repairs of cracking in these welds. On this basis, the staff finds that the applicant has provided an acceptable basis for crediting the BWR CRD Return Line Nozzle Program for aging management of cracking/flaw growth in these components as a result of exposure to the reactor coolant.

In LRA Table 3.1.2-1 the applicant includes its plant-specific AMR items for managing cracking and loss of material in the carbon steel reactor pressure vessel support skirt ring girders and cracking in the high strength alloy steel reactor pressure vessel support skirt bolts that are exposed to a indoor air environment. In these AMRs, the applicant credits its Inservice Inspection Program – IWF for aging management of these aging effects. The staff noted that the applicant's Inservice Inspection Program – IWF is a condition monitoring program that is based on compliance with the requirements of 10 CFR 50.55a and the ASME Code Section XI, Subsection IWF for ASME Code Class components supports and that the applicant program is based on conformance with the staff's recommended program elements in GALL AMP XI.S3, "ASME Section XI, Subsection IWF." Based on this review, the staff finds that the applicant has provided an acceptable basis for crediting its Inservice Inspection Program –IWF to manage cracking and loss of material in the reactor pressure vessel support skirt ring girders and cracking of the reactor pressure vessel support skirt bolts because these components are ASME Code Class 1 component supports. The staff evaluates the ability of the Inservice Inspection Program - IWF to manage aging in ASME Code Class 1 components in SER Section 3.0.3.1.21

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.2 Aging Management Review Results - Reactor Vessel Internals – LRA Table 3.1.2-2

The staff reviewed LRA Table 3.1.2-2, which summarizes the results of AMR evaluations for the

RV internals component groups.

In LRA Table 3.1.2-2, the applicant includes its plant-specific AMRs on management of reduction in fracture toughness for the following stainless steel (including CASS) reactor vessel (RV) internal components that are exposed to the treated water environment of the reactor coolant and an integrated neutron flux:

- Core shroud (including upper, intermediate, and lower shroud shells and welds)
- Core plate (including plate, beams, rim hold-down bolts and nuts, alignment assembly bolts and nuts and alignment pins)
- Top guide components (including beams and rim, alignment pins, bolts, nuts, and hold down clamps)
- Orificed and peripheral fuel support pieces
- Control Rod Drive tubes
- Jet pump assemblies and their subcomponents
- Incore dry tubes from the source range and intermediate range monitors

In these AMRs, the applicant states that it credits its BWR Vessel Internals Program to manage reduction of fracture toughness in the components.

The staff noted that in Table IV.B1 of GALL Volume 2, the staff identifies that the following cast austenitic stainless steel (CASS) BWR RV internal components may be subject to reduction of fracture toughness as a result of thermal aging embrittlement and neutron irradiation embrittlement:

- Fuel supports and CRD drive assemblies – fuel orifice supports (GALL AMR IV.B1-9)
- Jet pump assembly castings (GALL AMR IV.B1-11)

The staff noted that the applicant's plant-specific AMRs for these RV internal components accounts for the fact that, even though the components were not fabricated from a stainless steel casting method (i.e. the stainless steel components are made by forged or wrought fabrication methods, and thus the components not subject to the phenomenon of thermal aging embrittlement), the components are located in areas of high neutron flux and that the components may be subject to reduction of fracture toughness as a result of exposure to a high integrated neutron flux. Thus, the staff finds that the applicant has taken a conservative approach relative to the information on management of fracture toughness in GALL Table IV.B1 for BWR RV internal components.

The staff also noted that the applicant's AMRs did identify reduction (loss) of fracture toughness as an applicable aging effect requiring management (AERM) for these RV internal components (as listed in the bullets above), implying that these RV internal components are exposed to a high integrated neutron flux. The staff finds that the applicant's identification that reduction of fracture toughness is an applicable AERM for these components to be acceptable because it is in conformance with the aging effect discussion for loss of fracture toughness in GALL Table IX.E and the neutron irradiation embrittlement aging mechanism discussion in GALL Table IX.F

The staff noted, however, that the applicant had credited its BWR Vessel Internals Program to manage reduction in fracture toughness in these RV internal components. The staff verified that the applicant's BWR Vessel Internals Program is given in LRA Section B.2.9 and that the program is identified as an AMP that is consistent with the program elements in GALL AMP XI.M9, "BWR Vessel Internals, with an exception. The staff noted that this AMP credits the augmented inspection and flaw evaluation criteria in NRC-approved BWRVIP topical reports as the basis for managing the aging effects that are applicable to BWR RV and RV internal components. The staff noted that reduction in fracture toughness is not an aging effect “per se” but instead refers to a change that may occur in the fracture toughness material property over time. In its review of the applicant’s BWR Vessel Internals Program, the staff noted that the applicant credits the program with limited aging management of reduction of fracture toughness in RV internal components. However, the staff determined that some additional information would be needed to clarify how the recommended BWRVIP report guidelines within the scope of AMP B.2.9, BWR Vessel Internals Program, would accomplish adequate management of reduction of fracture toughness in these RV internal components. In RAI 3.1.2.3.2.1-1/B.2.9-4 by letter dated July 23, 2008, the staff asked the applicant to justify why the applicable BWRVIP inspection and flaw evaluation guidelines are considered to be capable of managing reduction of fracture toughness in these RV internals and to clarify the methodology or methodologies in these reports that are credited for management of this aging effect.

In its response to RAI 3.1.2.3.2.1-1/B.2.9-4 dated August 27, 2008, the applicant stated that “applicable BWRVIP inspection and flaw evaluation guidelines for RV internal components are considered to be capable of managing reduction of fracture toughnss (ROFT) because the inspections are designed to detect cracking, and, if cracking is detected, the inspection intervals will be adjusted based on crack growth rates that are determined by evaluations that include the effects of ROFT. The examination methods in the BWRVIP reports include ultrasonic examination and visual examination of the RV internal components, when accessible, for the detection of cracks. These same methods are credited for managing ROFT, since ROFT is managed as cracking is identified, evaluated, and monitored in components with fluence values exceeding the threshold for ROFT.”

Because the BWRVIP guidelines provide examination methods and evaluation techniques to detect cracking, and inspection intervals are adjusted based on the results of the inspection, the staff finds that the guidelines will also manage ROFT, since fluence is one of the key factors affecting the crack growth rate, which increases as fluence increases the yield strength of the material (i.e., reduces fracture toughness). The staff reviewed the applicant’s BWR Vessel Internals Program and its evaluation is documented in SER Section 3.0.3.2.4. On this basis, the staff finds the applicant response acceptable, and considers the issue closed.

On this basis, the staff finds that the applicant has provided an acceptable basis for crediting the BWR Vessel Internals Program for aging management of reduction of fracture toughness in these components as a result of exposure to treated water environment of the reactor coolant and an integrated neutron flux.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3 Aging Management Review Results - Reactor Coolant System Pressure Boundary – LRA Table 3.1.2-3

The staff reviewed LRA Table 3.1.2-3, which summarizes the results of AMR evaluations for the reactor coolant system pressure boundary component groups.

In LRA Table 3.1.2-3, the applicant proposed to manage loss of material for steel material for driver mount, piping and fitting components exposed to an external environment of indoor air using the AMP B.2.32 “System Walkdown Program.” In addition, the applicant also proposed to manage the loss of material for carbon steel valve bodies (≥ 4 and < 4 in.) components exposed to external environment of indoor air using the AMP B.2.32 “System Walkdown Program.”

The AMR line item credits the AMP B.2.32 “System Walkdown Program” to manage loss of material for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in GALL Report for this component, environment and material combination. The staff’s evaluation of the AMP B.2.32 “System Walkdown Program” is documented in SER Section 3.0.3.2.15. The staff determined that this program is a condition monitoring program that will detect the aging effect of loss of material for metals, including steel, by periodic surveillance activities and observations of components’ external surfaces to detect aging degradation that are with in the scope of license renewal. On the basis that the applicant will be performing periodic visual inspections of these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.1.2-3, the applicant includes its plant-specific AMR on management of cracking and flaw growth in the internal reactor recirculation pump thermal barrier surfaces that are exposed to the treated, closed-cycle cooling water environment. In these AMRs, the applicant identifies that cracking and flaw growth is an applicable aging effect requiring management (AERM) for the internal component surfaces that are exposed to the treated, closed-cycle cooling water environment. In these AMRs, the applicant credits a combination of the Closed Cooling Water Chemistry Program and BWR Stress Corrosion Cracking Program to manage cracking and flaw growth in the internal thermal barrier surfaces that are exposed to the treated, closed-cycle cooling water environment.

The staff verified that the applicant had included a plant-specific AMR on cracking and flaw growth in the internal surfaces of the reactor recirculation pump thermal barriers that are exposed to the treated, closed-cycle cooling water environment, and that, in this AMR, the applicant credited both its Closed Cooling Water Chemistry Program and BWR Stress Corrosion Cracking Program to manage cracking and flaw growth in the internal component surfaces that are exposed to closed-cycle cooling water.

The staff was initially of the opinion that it might not be appropriate to credit the BWR Stress Corrosion Cracking Program for aging management of cracking and flaw growth in the internal surfaces of the reactor recirculation pump thermal barriers because they may be located in areas that are inaccessible for examination.

In RAI 3.1.2.3.3.3-1, Part A dated July 23, 2008, the staff asked the applicant to identify the type of examinations that will be used under the BWR Stress Corrosion Cracking Program to monitor for and detect cracking and flaw growth in the internal surfaces of the recirculation pump thermal barriers that are exposed to closed-cycle cooling water, and to clarify whether the internal surfaces of the reactor recirculation pump thermal barriers are accessible for the examination method that is credited for aging management.

The staff also noted that the applicant has credited the Closed Cooling Water Chemistry Program to manage cracking and flaw growth in internal surfaces of these components. The staff noted, however, that these components are made of alloy steel without internal stainless steel or Nickel-alloy cladding. The staff noted that Closed Cooling Water Chemistry Program would only be a valid program to credit for management of cracking/flaw growth if the mechanisms inducing cracking and flaw growth were chemistry-related or corrosion-related cracking/flaw growth mechanisms, such as stress corrosion cracking (SCC and its forms such as primary water stress corrosion cracking [PWSCC] or intergranular stress corrosion cracking [IGSCC]) or intergranular attack (IGA). Thus, the staff was of the opinion that the Closed Cooling Water Chemistry Program would only be a valid program to credit if the cracking/flaw growth was induced by either SCC, PWSCC, IGSCC or IGA. In Part B, the staff asked the applicant to clarify the aging mechanisms that could induce cracking and flaw growth in the internal surfaces of the reactor recirculation pump thermal barriers, and based on these mechanisms, to provide its basis why the Closed Cooling Water Chemistry is considered to be a valid AMP for managing cracking and flaw growth in these components.

In its response to RAI 3.1.2.3.3.3-1, Part A dated August 27, 2008, the applicant stated that the internal surfaces of the reactor recirculation pump thermal barrier consist of the bored channels that provide the flowpath for the Reactor Building Closed Cooling Water (RBCCW). The applicant also stated that these internal surfaces are inaccessible for inspection; as such, the BWR Stress Corrosion Cracking (SCC) Program is not an appropriate aging management program for cracking.

The applicant further stated that “an appropriate aging management approach is to credit the Closed Cooling Water (CCW) Chemistry Program supplemented by the Chemistry Program Effectiveness Inspection (CPEI). As described in LRA Section B.2.14, these programs will manage cracking for stainless steel components exposed to closed cooling water. Although the internal surfaces of the reactor recirculation pump thermal barrier are inaccessible for inspection, the CPEI will inspect other components of like material exposed to CCW to confirm that cracking has been effectively mitigated or to detect any degradation that is occurring.”

In response to RAI 3.1.2.3.3.3-1, Part B dated August 27, 2008, the applicant stated that “the aging mechanism capable of inducing cracking and flaw growth in the internal surfaces of the reactor recirculation pump thermal barriers is stress corrosion cracking (SCC). The pump thermal barrier is susceptible to SCC because it is made of stainless steel and is subjected to a closed cycle cooling water environment. Cracking due to SCC on the internal surfaces of the thermal barrier is mitigated by water chemistry control via the Closed Cooling Water Chemistry Program. This is consistent with GALL item VII.C2-11, which is for stainless steel components exposed to closed cycle cooling water. The GALL item recommends the closed cooling water program for management of cracking due to SCC. It is noted that there is no direct comparison in GALL Section IV for the internal surfaces of the thermal barrier because GALL Section IV does not address a closed cooling water environment.

The applicant revised Table 3.1.2-3 for CASS pump thermal barrier to delete BWRSCC Program as the verification program for Closed Cycle Cooling Water Chemistry and instead credits the Chemistry Program Effectiveness Inspection as the verification program. The applicant also revised the footnote H to footnote E.

The staff reviewed the applicant response and the changes to the LRA. The GALL Report item VII.C2-11 addresses stainless components in an environment of closed cycle cooling water > 140^0F with an aging effect of cracking due to SCC. For this line, the GALL Report recommends GALL AMP XI.M21, “Closed Cycle Cooling Water System,” to manage the aging effects. The applicant is crediting its Closed Cycle Cooling Water System program, which is consistent with the GALL Report recommendation, and, in addition, is crediting the Chemistry Program Effectiveness Inspection. The staff evaluates the ability of the Closed Cycle Cooling Water System Program and Chemistry Program Effectiveness Inspection to manage cracking in these components in SER Sections 3.0.3.2.7 and 3.0.3.1.10 respectively. On the basis that the applicant is consistent with the GALL Report, the staff finds that applicant response acceptable and concludes that the Closed Cycle Cooling Water System Program and Chemistry Program Effectiveness Inspection will adequately manage the aging effect of cracking due to SCC in CASS reactor recirculation pump thermal barrier in an environment of closed cycle cooling water > 140^0F during the period of extended operation.

In LRA Table 3.1.2-3, the applicant includes its plant-specific AMR on management of cracking/flaw growth in the unclad steel N15 reactor vessel (RV) drain nozzles that are exposed internally to the treated water environment of the reactor coolant. In these AMRs, the applicant identifies that cracking/flaw growth is an applicable aging effect requiring management (AERM) for the internal component surfaces that are exposed to the treated water environment of the reactor coolant. In these AMRs, the applicant credits a combination of BWR Water Chemistry Program and the BWR Penetrations Program for management of cracking/flaw growth in the internal component surfaces that are exposed to the treated water environment of the reactor coolant.

The staff verified that, in its AMR for managing cracking and flaw growth in the N15 RV drain nozzles, the applicant credits a combination of its BWR Water Chemistry Program and the BWR Penetrations Program to manage this aging effect.

The staff verified that in AMP B.2.8 the applicant identifies that the BWR Penetrations Program is credited for managing cracking that is projected to occur in the SSES RV penetration nozzles and that the program is designated as an AMP that is consistent with the program elements in GALL AMP XI.M8, “BWR Penetrations,” with an exception to include additional RV penetrations (including the N15 RV drain nozzles) within the scope of the program. In RAI B.2.8-1 by letter dated July 23, 2008, the staff asked the applicant to provide its basis for extending the scope of the BWR Penetrations Program to the RV drain nozzles. The scope of RAI B.2.8-1 is also applicable to the staff’s assessment of the applicant’s AMR item on cracking and flaw growth of the N 15 RV drain nozzles and their associated nozzle-to-vessel welds.

The staff noted that the applicant has also credited the BWR Water Chemistry Program to manage cracking and flaw growth in these components. The staff noted, however, that these components are made of alloy steel without internal stainless steel or Nickel-alloy cladding. The staff noted that BWR Water Chemistry Program would only be a valid program to credit for management of cracking/flaw growth if the mechanisms inducing cracking and flaw growth were chemistry-related or corrosion-related cracking/flaw growth mechanisms, such as stress corrosion cracking (SCC and its forms such as primary water stress corrosion cracking [PWSCC] or intergranular stress corrosion cracking [IGSCC]) or intergranular attack (IGA).To date, SCC or IGA have not been identified as aging mechanisms of concern for steel materials (including carbon steels and alloy steels).

The staff noted that the N15 RV drain nozzles are designated as alloy steel nozzles without stainless steel or Nickel-alloy cladding. Thus, the staff was of the opinion that the BWR Water Chemistry Program would only be a valid program to credit if the cracking/flaw growth was induced by SCC, PWSCC, IGSCC or IGA. In RAI 3.1.2.3.3.4-1, Part A by letter dated July 23, 2008, the staff asked the applicant to clarify the weld material that was used to fabricate the N15 RV drain nozzle-to-vessel welds. In RAI 3.1.2.3.3.4-1, Part B, the staff asked the applicant to clarify the aging mechanisms that could induced cracking and flaw growth in the N15 RV drain nozzles and their associated nozzle-to-vessel welds, and based on these mechanisms, to provide its basis why the BWR Water Chemistry is considered to be a valid AMP for managing cracking and flaw growth in these components.

In its response to RAI 3.1.2.3.3.4-1dated August 27, 2008, the applicant stated:

> Part A. The NI 5 RV drain nozzles were constructed by boring a hole through the bottom head of the reactor vessel and then welding a short length of a forged pipe (nozzle) to the outside surface of the bottom head. The weld material between the low alloy nozzle (SA-508 Class 1) and the low alloy vessel (SA-533 Grade B) is low alloy steel, compatible with the vessel and nozzle materials. The weld consists of two parts; the weld buildup on the outside diameter of the bottom head of the vessel, and the weld between the nozzle and the weld buildup. The weld buildup material is E8018-G, trade name Atom Arc 8018NM, conforming to the current specification for E8018-NM1. The material for the weld between the nozzle and the weld buildup is equivalent to E8018-NM, trade name Adcom 1NMM.
>
> The line entry for drain nozzle N15 in LRA Table 3.1.2-1 (LRA page 3.1-45) identifies the drain nozzle as low alloy steel with partial stainless steel (SS) clad. The SS cladding is only on the inside diameter of the bottom head of the vessel, extending just slightly into the bore from the inside diameter of the vessel. There is no cladding on the inside diameter of the vessel bore hole, the weld, or the drain nozzle.
>
> Part B**.** The aging mechanism that is capable of inducing cracking and flaw growth in the N15 RV drain nozzle and associated weld is crack initiation and flaw growth due to thermal and mechanical loading. The BWR Water Chemistry Program does not mitigate cracking caused by this mechanism. LRA Table 3.1.2-1 and line item 3.1.1-40 in Table 3.1.1 are revised to remove the BWR Water Chemistry Program from this entry.

The staff reviewed the applicant's response and finds, that because the material of the drain nozzle is alloy steel, cracking is caused by thermal and mechanical loading, and BWR water chemistry does not mitigate cracking caused by this mechanism. Therefore, the staff finds it acceptable to delete the Water Chemistry Program from this line item. The BWR Penetration Program includes inspection and flaw evaluation in conformance with the guidelines of NRC-approved BWRVIP reports BWRVIP-49 and BWRVIP-27, and is consistent with the GALL AMP XI.M8. Therefore, based on the review of the BWR Penetrations Program as documented in SER Section 3.0.3.2.3, the staff finds that the BWR Penetrations Program will adequately manage the aging effect of cracking in the N15 penetration nozzle.

In LRA Table 3.1.2-3, the applicant proposed to manage cracking in carbon steel piping and fittings (< 4 inch) and in carbon steel valves (<4 inch) in an environment of treated water using the Small Bore Class 1 Piping Inspection, alone. The applicant cited generic note H for these AMR results, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. The staff noted that the component, material, environment and aging effect combination for these lines appears to be the same as in the GALL Report line IV.C1-1 (where the material is stainless steel or steel). In a letter dated July 15, 2008, the staff issued RAI 3.1-7 asking the applicant to explain why note H was used for these lines and to justify why the AMP proposed by the applicant provides acceptable aging management for these components.

The applicant responded to RAI 3.1-7 in a letter dated August 15, 2008. In their response, the applicant revised the results for these two AMR result lines in LRA Table 3.1.2-3. In the revision, the applicant changed the GALL Report reference for these two lines from “N/A” to “IV.C1-1” and changed the Table 1 item reference from “N/A” to “3.1.1-48.” The applicant also changed from citing note H to citing note E for these components and added the Inservice Inspection (ISI) Program as an additional AMP to manage the aging effect of cracking in these components. The staff’s evaluation of the applicant’s response to RAI 3.1-7 and the related LRA changes is documented in SER Section 3.1.2.1.2.

In LRA Table 3.1.2-3 the applicant includes its plant-specific AMR items for managing cracking in carbon steel piping, piping components, and piping elements, and valve bodies that are greater or equal to than 4 inches in diameter and that are exposed to a treated water environment. In these AMRs, the applicant credits its Inservice Inspection Program for aging management of cracking in the surfaces that are exposed to treated water. The staff noted that the applicant’s Inservice Inspection Program is a condition monitoring program that is based on compliance with the requirements of 10 CFR 50.55a and the ASME Code Section XI and that the applicant’s program is based on conformance with the staff’s recommended program elements in GALL AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.” Based on this review the staff finds that the applicant has provided an acceptable basis for crediting its Inservice Inspection Program to manage cracking in these components because these components are ASME Code Class components. The staff evaluates the ability of the Inservice Inspection Program to manage aging in ASME Code Class components in SER Section 3.0.3.2.1

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).

3.1.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the RV, RV internals, and reactor coolant system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2 Aging Management of Engineered Safety Features

This section of the SER documents the staff’s review of the applicant’s AMR results for the engineered safety features components and component groups of:

- Residual Heat Removal (RHR) System
- Reactor Core Isolation Cooling (RCIC) System
- Core Spray System
- High Pressure Coolant Injection (HPCI) System
- Containment and Suppression System
- Containment Atmosphere Control System
- Standby Gas Treatment System (SGTS)

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides AMR results for the engineered safety features components and component groups. LRA Table 3.2.1, “Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL Report,” is a summary comparison of the applicant’s AMRs with those evaluated in the GALL Report for the engineered safety features components and component groups.

The applicant’s AMRs evaluated and incorporated applicable plant-specific and industry OE in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant’s review of industry OE included a review of the GALL Report and OE issues identified since the issuance of the GALL Report.

3.2.2 Staff Evaluation

The staff reviewed LRA Section 3.2 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the engineered safety features components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant’s claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff’s evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff’s audit evaluation are documented in SER Section 3.2.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant’s further evaluations were consistent with the SRP-LR Section 3.2.2.2 acceptance criteria. The staff’s audit evaluations are documented in SER Section 3.2.2.2.

The staff also conducted a technical review of the remaining AMRs not consistent with or not addressed in the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff’s evaluations are documented in SER Section 3.2.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant’s OE to verify the applicant’s claims.

Table 3.2-1 summarizes the staff’s evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.2 and addressed in the GALL Report.

Table 3.2-1 Staff Evaluation for Engineered Safety Features Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system (3.2.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report (See SER Section 3.2.2.2.1)
Steel with stainless steel cladding pump casing exposed to treated borated water (3.2.1-2)	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks"	Yes	Not applicable	Not applicable to 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	Yes	Not applicable	Not applicable. The applicant addressed these components under GALL Report item number 3.2.1-5. (See SER Section 3.2.2.2.3.1)
Stainless steel piping, piping components, and piping elements exposed to soil (3.2.1-4)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to SSES (See SER Section 3.2.2.2.3.2)
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.2.1-5)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.2.2.2.3.3)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.2.1-6)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B.2.33) and Lubricating Oil Inspection Program (B.2.25)	Consistent with GALL Report (See SER Section 3.2.2.2.3.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Partially encased stainless steel tanks with breached moisture barrier exposed to raw water (3.2.1-7)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes	Not applicable	Not applicable (See SER Section 3.2.2.2.3.5)
Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal) (3.2.1-8)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	See SER Section 3.2.2.2.3.6
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.2.1-9)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Piping Corrosion Program (B.2.13)	Consistent with GALL Report (See SER Section 3.2.2.2.4.1)
Stainless steel heat exchanger tubes exposed to treated water (3.2.1-10)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Heat Exchanger Inspection (B.2.24)	Consistent with GALL Report (See SER Section 3.2.2.2.4.2)
Elastomer seals and components in standby gas treatment system exposed to air - indoor uncontrolled (3.2.1-11)	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes	System Walkdown (B.2.32)	Consistent with GALL Report (See SER Section 3.2.2.2.5)
Stainless steel high-pressure safety injection (charging) pump miniflow orifice exposed to treated borated water (3.2.1-12)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.2.2.2.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal) (3.2.1-13)	Loss of material due to general corrosion and fouling	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	See SER Section 3.2.2.2.7
Steel piping, piping components, and piping elements exposed to treated water (3.2.1-14)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.2.2.2.8.1)
Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water (3.2.1-15)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable. The applicant addressed these components under GALL Report item number 3.2.1-14. (See SER Section 3.2.2.2.8.2.)
Steel piping, piping components, and piping elements exposed to lubricating oil (3.2.1-16)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B.2.33) and Lubricating Oil Inspection Program (B.2.25)	Consistent with GALL Report (See SER Section 3.2.2.2.8.3)
Steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil (3.2.1-17)	Loss of material due to general, pitting, crevice, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Not applicable	Not applicable to SSES (3.2.2.2.9)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.2.1-18)	Cracking due to SCC and IGSCC	BWR Stress Corrosion Cracking and Water Chemistry	No	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.2.2.1.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to steam or treated water (3.2.1-19)	Wall thinning due to FAC	Flow-Accelerated Corrosion	No	Flow-Accelerated Corrosion (B.2.11)	Consistent with GALL Report
Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated or unborated) > 250°C (> 482°F) (3.2.1-20)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable	Not applicable. (See SER Section 3.2.2.1.1)
High-strength steel closure bolting exposed to air with steam or water leakage (3.2.1-21)	Cracking due to cyclic loading, SCC	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel closure bolting exposed to air with steam or water leakage (3.2.1-22)	Loss of material due to general corrosion	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel bolting and closure bolting exposed to air - outdoor (external), or air - indoor uncontrolled (external) (3.2.1-23)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.2.1-24)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Not applicable	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water > 60°C (> 140°F) (3.2.1-25)	Cracking due to SCC	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.2.1-26)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Steel heat exchanger components exposed to closed cycle cooling water (3.2.1-27)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.2.2.1.**5**.)
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water (3.2.1-28)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.2.2.1.**5**.)
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.2.1-29)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.2.2.1.5.)
Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.2.1-30)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Piping Corrosion (B.2.13), and Heat Exchanger Inspection (B.2.24)	Consistent with GALL Report (See SER Section 3.2.2.1.2)
External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external) (3.2.1-31)	Loss of material due to general corrosion	External Surfaces Monitoring	No	System Walkdown (B.2.32), and Supplementary Piping/Tank Inspection (B.2.28)	Consistent with GALL Report (See SER Section 3.2.2.1.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping and ducting components and internal surfaces exposed to air - indoor uncontrolled (Internal) (3.2.1-32)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Preventive Maintenance Activities – HPCI/RCIC Turbine Casings (B.2.48), System Walkdown (B.2.32), and Supplementary Piping/Tank Inspection (B.2.28)	Consistent with GALL Report (See SER Section 3.2.2.1.3)
Steel encapsulation components exposed to air - indoor uncontrolled (internal) (3.2.1-33)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Steel piping, piping components, and piping elements exposed to condensation (internal) (3.2.1-34)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Addressed under 3.2.1-32 (See SER Section 3.2.2.1.1)
Steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-35)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Steel heat exchanger components exposed to raw water (3.2.1-36)	Loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to raw water (3.2.1-37)	Loss of material due to pitting, crevice, and MIC	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Stainless steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-38)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel heat exchanger components exposed to raw water (3.2.1-39)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water (3.2.1-40)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Copper alloy > 15% Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.2.1-41)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching Inspection Program (B.2.29)	Consistent with GALL Report
Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water (3.2.1-42)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching Inspection Program (B.2.29)	Consistent with GALL Report
Gray cast iron piping, piping components, and piping elements exposed to soil (3.2.1-43)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Gray cast iron motor cooler exposed to treated water (3.2.1-44)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Aluminum, copper alloy > 15% Zn, and steel external surfaces, bolting, and piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-45)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	No	Not applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel encapsulation components exposed to air with borated water leakage (internal) (3.2.1-46)	Loss of material due to general, pitting, crevice and boric acid corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Not applicable to 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	No	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 SCC	Water Chemistry	No	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	No	Not applicable	Not applicable to BWRs
Aluminum piping, piping components, and piping elements exposed to air - indoor uncontrolled (internal/external) (3.2.1-50)	None	None	No	None	Consistent with GALL Report
Galvanized steel ducting exposed to air - indoor controlled (external) (3.2.1-51)	None	None	No	None	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Glass piping elements exposed to air - indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water (3.2.1-52)	None	None	No	None	Consistent with GALL Report
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.2.1-53)	None	None	No	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.2.1-54)	None	None	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.2.1-55)	None	None	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas (3.2.1-56)	None	None	No	Not applicable	Not applicable to SSES (See SER Section 3.2.2.1.1)
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-57)	None	None	No	Not applicable	Not applicable to BWRs

The staff's review of the engineered safety features component groups followed any one of several approaches. One approach, documented in SER Section 3.2.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.2.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.2.2.3, reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the engineered safety features components is documented in SER Section 3.0.3.

3.2.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.2.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the engineered safety features components:

- BWR Water Chemistry Program
- Flow-Accelerated Corrosion (FAC) Program
- Bolting Integrity Program
- Piping Corrosion Program
- Fire Water System Program
- Chemistry Program Effectiveness Inspection
- Heat Exchanger Inspection
- Lubricating Oil Inspection
- Supplemental Piping/Tank Inspection
- Selective Leaching Inspection
- System Walkdown Program
- Lubricating Oil Analysis Program
- Preventive Maintenance Activities - RCIC/HPCI Turbine Casings

LRA Tables 3.2.2-1 through 3.2.2-7 summarize AMRs for the engineered safety features components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the engineered safety features ESF components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.2.1, the applicant's references to the GALL Report are acceptable and no further staff review is required, with the exception of the following AMRs that the applicant had identified were consistent with the AMRs of the GALL Report and for which the staff felt were in need of additional clarification and assessment. The staff's evaluations of these AMRs are providing in the subsections that follows.

3.2.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.2.1, item 20, the applicant indicates that the corresponding AMR result line in the GALL Report is not applicable because there are no CASS components in the ESF systems for SSES that are exposed to treated water > 250°C (>482°F). The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES do not have ESF CASS components in the environment stated above. Therefore, the staff finds the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 25, the applicant states that the corresponding AMR result line in the

GALL Report is not applicable because there are no stainless steel piping and piping components in the ESF systems for SSES that are exposed to closed-cycle cooling water > 60°C (>140°F). The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES does not have this commodity group in the ESF System. Therefore, the staff finds the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 26, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because there are no steel piping and piping components in the ESF systems for SSES that are exposed to closed-cycle cooling water. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that this line item is not applicable to SSES. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 33, the applicant states that the corresponding AMR result line in the GALL Report is not applicable the ESF systems include no steel encapsulation components. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 34, the applicant states that the corresponding AMR result line are addressed under item 3.2.1-32. The staff reviewed the documentation supporting the applicant's AMR evaluation in items 3.1.1-32, and no SESS AMR line items roll up to 3.1.1-34. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 35, the applicant indicates for that the corresponding AMR result line, there are no steel containment isolation piping or components exposed to raw water in the ESF systems for SSES. In addition, the applicant indicated that this item is applied to loop seal valves exposed to raw water in the SGTS. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no steel containment isolation piping or components exposed to raw water in the ESF System. In addition, the staff reviewed the Table 2 items which correspond to loop seal valves exposed to raw water in the SGTS, and finds the applicant's management of these line item components consistent with the GALL Report. Therefore, the staff agrees with the applicant's treatment of line item 3.2.1-35.

In LRA Table 3.2.1, items 37 and 38, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because there are no stainless steel piping, piping components, or piping elements exposed to raw water in the ESF Systems, and no stainless steel containment isolation piping or components exposed to raw water in the ESF Systems respectively. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no in-scope stainless steel piping, piping components, piping elements, containment isolation piping or components in the ESF Systems. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result lines in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 43, the applicant indicates for this corresponding AMR result line in the GALL Report, there are no gray cast iron piping, piping components, or piping elements exposed to soil in the ESF systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that no SSES components in the ESF systems align to this item. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report, and finds this line item as not applicable to SSES.

In LRA Table 3.2.1, item 44, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because there are no gray cast iron motor coolers exposed to treated water in the ESF systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no in-scope gray cast iron motor coolers exposed to treat water in the ESF Systems. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 54, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because there are no steel components exposed to indoor air (controlled) environments in ESF systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that no components under this commodity group exist in the ESF. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 55, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because there are no steel or stainless steel components embedded in concrete in the ESF Systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.2.1, item 56 the applicant states that the corresponding AMR result line in the GALL Report is not applicable because there are no steel, stainless steel, or cooper alloy components in the ESF systems for SSES that are exposed to gas. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no in-scope steel, stainless steel, or cooper alloy components in the ESF that are exposed to gas. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

3.2.2.1.2 Reduction of Heat Transfer due to Fouling

In LRA Table 3.2.2.-1, the applicant stated that reduction of heat transfer of RHR heat exchanger copper alloy tubes in an external environment of treated water is managed by the Piping Corrosion Program.

The staff noted that the applicant applied note E to this item. The applicant referenced Table 3.2-1, item 3.2.1-30 and GALL Report Volume 2, item V.A-11. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M21, "Closed-Cycle Cooling Water System," the applicant proposed using the Piping Corrosion Program. The staff also noted that the internal environment of the tubes is raw water and the heat exchanger is part of the GL 89-13 Program.

The GALL recommended AMP XI.M21, Closed-Cycle Cooling Water System, recommends preventive measures to minimize corrosion and testing and inspection to monitor the effects of corrosion. The staff reviewed the Piping Corrosion Program, which includes preventive measures such as chemical treatment and cleaning, and testing and inspection on a periodic basis as per the commitments in response to NRC Generic Letter 89-13. Based on this review, the staff finds that the Piping Corrosion program will adequately manage the aging effect of reduction of heat transfer of copper alloy heat exchanger tubes in an external environment of treated water for the period of extended operation.

In LRA Tables 3.2.2.-2 and 3.2.2-4, the applicant states that reduction of heat transfer of RCIC and HPCI heat exchanger copper alloy tubes in an internal environment of treated water is managed by the Heat Exchanger Inspection Program.

The staff noted that the applicant applied note E to this item. The applicant referenced Table 3.2-1, item 3.2.1-30 and GALL Report Volume 2, item V.A-11. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M21, "Closed-Cycle Cooling Water System," the applicant proposed using the Heat Exchanger Inspection Program.

The GALL recommended AMP XI.M21, Closed-Cycle Cooling Water System, recommends preventive measures to minimize corrosion and testing and inspection to monitor the effects of corrosion, whereas the applicant is proposing only a one-time inspection activity. The staff issued RAI 3.2.2.1-1 dated July 23, 2008 requesting the applicant to justify how the one-time heat exchanger inspection activity by itself will manage the aging effect of reduction in heat transfer, without preventive measures to minimize corrosion, such as maintaining treated water chemistry control.

In its response to RAI 3.2.2.1-1dated August 22, 2008, the applicant stated that as indicated in Tables 3.2.2-2 and 3.2.2-4, the BWR Water Chemistry Program is credited for managing loss of material for copper alloy heat exchanger tubes exposed to treated water. The applicant also stated that since the BWR Water Chemistry Program does not contain measures for detection of aging effects through inspection, it is not credited for managing reduction in heat transfer; however, it is recognized that the same preventive actions by which the water chemistry program manages loss of material also mitigates the conditions that could result in reduction in heat transfer. The applicant further stated that due to the BWR water chemistry control, fouling of heat exchanger tubes is not expected to occur. Therefore, the applicant concluded that as stated in LRA Section B.2.24, the Heat Exchanger Inspection will provide direct evidence as to whether, and to what extent, reduction in heat transfer has occurred, or is likely to occur, that could result in a loss of intended function.

The staff noted that in LRA Tables 3.2.2-2 and 3.2.2-4, the BWR Water Chemistry Program is credited for managing loss of material of RCIC turbine oil coolers and HPCI lube oil coolers. For these same coolers, the applicant has credited Heat Exchanger Inspection Program for reduction of heat transfer. On the basis that water chemistry is maintained to minimize corrosion and fouling, the staff finds the use of Heat Exchanger Inspection Program acceptable for managing the aging effects of reduction of heat transfer for copper alloy heat exchanger tubes exposed to treated water and finds the applicant response acceptable. The evaluation of the Heat Exchanger Program is documented in SER Section 3.0.3.1.12.

3.2.2.1.3 Loss of material due to general corrosion

In 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 Standby Gas Treatment System. The GALL Report recommends GALL 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 AMR results lines that reference note E and determines that the material, environment, and aging effect are consistent with the GALL Report.

The staff reviewed the applicant's AMP B.2.32 "System Walkdown Program" and its evaluation is documented in SER Sections 3.0.3.2.15. The staff determined that this aging management program which include surveillance activities and observations that are adequate to manage loss of material due to general corrosion for steel components exposed to ventilation (internal) addressed by this AMR are consistent with those activities recommend by GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components". However the applicant is crediting the AMP B.2.32, which performs visual inspections of the external surfaces only, for the internal surfaces of fan and filter housings, piping, valve bodies, plenums, and SGTS filter unit enclosures. The staff felt that additional information was needed and therefore, by letter dated July 23. 2008 the staff issued RAI 3.x.2.1-1 requesting the applicant to justify the basis for crediting AMP B.2.32, which performs visual inspections of external surfaces only, for the internal surfaces of steel ventilation system enclosures and for piping components in ventilation environments.

In its response to RAI 3.x.2.1-1 dated August 22, 2008, the applicant stated that the internal ventilation environment of that these components are exposed to is the same as the environment the external surfaces are exposed to because this system is normally in a standby mode in which the relevant temperature and humidity is the same on the external and internal surface. The staff noted that crediting an external visual inspection for managing aging of the internal surface if the environments are the same is consistent with the recommendations given in the program element, "scope of program", of GALL AMP XI.M36 "External Surfaces Monitoring", in which a visual inspection of the external surfaces may be representative of the internal surfaces if the environment is the same for the external and internal surfaces. The staff noted that internal surfaces of the Standby Gas Treatment System filter unit enclosure and piping may experience a different environment at the air/water interface of the mist eliminator loop seal, so the applicant is supplementing the AMP B.2.32 "System Walkdown Program" with the AMP B.2.28 "Supplemental Piping/Tank Inspection" and the staff confirmed that the AMP B.2.28 will provide verification if degradation has occurred on the internal surfaces of these components and the effectiveness of the AMP B.2.32 "System Walkdown Program" for managing loss of material. On the basis of its review, the staff finds the applicable portion of the applicant's response that references GALL Item V.B-1 to be acceptable because (1) the environments of the external surface and internal surface is the same and consistent with the recommendations provided in GALL that an visual inspection of the external surface can be credited for managing aging of the internal surfaces if the environments are the same and (2) the applicant has credited a one-time inspection to verify if degradation has occurred and the effectiveness of the Systems Walkdown Program when the environment of the external surface may be different than the environment of the internal surface. On this basis, the staff finds the AMR results for this line item acceptable.

In LRA Tables 3.2.2-1 and 3.2.2-2, the applicant states that loss of material of RHR and RCIC steel piping in an internal environment of ventilation and external environment of indoor air is managed by the Supplementary Piping/Tank Inspection Program.

The staff noted that the applicant applied note E to this item. The applicant referenced Table 3.2-1, items 3.2.1-31 and 3.2.1-32 and GALL Report Volume 2, items VD2-16 and VD2-2. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M39, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," and AMP XI.M36, “External Surface Monitoring”, the applicant proposed using the Supplementary Piping/Tank Inspection Program.

The LRA also references footnote 0203, which states that the environment is an aggressive air/water interface in the suppression pool. The staff determined that in this environment, loss of material is due to general, crevice and pitting corrosion. The Supplementary Piping/Tank Inspection Program uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations of air/water interface, and employs more conservative inspection techniques than the visual inspection of Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components and the External Surfaces Monitoring Program, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

In Table 3.2.2-5, the LRA states that loss of material of containment and suppression system steel downcomers in an external environment of indoor air is managed by the Supplementary Piping/Tank Inspection Program.

The staff noted that the applicant applied note E to this item. The applicant referenced Table 3.2-1, item 3.2.1-31 and GALL Report Volume 2, item VB-3. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP AMP XI.M36, “External Surface Monitoring”, the applicant proposed using the Supplementary Piping/Tank Inspection Program.

The LRA also references footnote 0212, which states that the environment is an aggressive air/water interface in the suppression pool. The staff determined that in this environment, loss of material is due to general, crevice and pitting corrosion. The Supplementary Piping/Tank Inspection Program uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations, and employs more conservative inspection techniques than the visual inspection of External Surfaces Monitoring Program, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

In Table 3.2.2-7, the LRA states that loss of material of standby gas treatment system steel filter unit enclosure and skimmer surge tanks in an internal environment of ventilation is managed by the Supplementary Piping/Tank Inspection Program.

The staff noted that the applicant applied note E to this item. The applicant referenced Table 3.2-1, item 3.2.1-32 and GALL Report Volume 2, item V.B-1. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M39, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," the applicant proposed using the Supplementary Piping/Tank Inspection Program.

The LRA also references footnote 0215, which states that the environment is an aggressive air/water interface in the suppression pool. The staff determined that in this environment, loss of material is due to crevice and/or pitting corrosion and MIC (at the airwater interface in the mist eliminator loop seals), and galvanic corrosion (at contact points with the mist eliminator housing. The Supplementary Piping/Tank Inspection Program uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff's evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations, and employs more conservative inspection techniques than the visual inspection of Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

LRA Table 3.3.1, line items 3.2.1-32 addresses the results of an AMR for Steel piping and ducting components exposed internal air – indoor uncontrolled. The applicant addresses cast iron and carbon steel piping, pump casings, rupture disks and valve bodies in the Reactor Core Isolation Cooling System and High Pressure Coolant Injection System. The applicant states that the aging effect requiring management is loss of material and proposes to use the Preventive Maintenance Activities – RCIC/HPCI Turbine Casings to manage the effects of aging.

The applicant has indicated generic note E for this line item which is consistent with the GALL report for material, environment, and aging effect, but a different aging management program. The staff noted that the GALL Report recommends GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" for GALL AMR Item V.D2-16. The staff noted that the GALL AMP XI.M38 recommends periodic visual inspections during maintenance and surveillance activities to detect age-related degradation, such as loss of material due to general corrosion.

The staff's evaluation of the AMP B.2.48 is documented in SER Section 3.0.3.3.3. The staff noted that this program is a plant-specific program that performs a periodic visual inspection of the carbon steel and cast iron internal surfaces of the RCIC and HPCI pump turbine casings (and gland cases) and the in-scope piping and piping components in steam lines downstream from the steam admission valves, by qualified personnel. The staff noted that the visual inspections being performed will detect rust, discoloration and other signs of degradation that may be indicative of wall-thinning and loss of material. The staff further noted that if unacceptable visual indications of wall-thinning or loss of material the applicant will initiate appropriate corrective actions. The staff determined that a visual inspection will be capable of detecting loss of material, which is consistent with the inspection techniques recommended by GALL AMP XI.M38. On the basis that the applicant will be performing periodic visual inspections on the components with in the scope of this program and will initiate appropriate corrective actions if unacceptable loss of material or wall-thinning has occurred, the staff finds the AMR results for this line item acceptable.

3.2.2.1.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

LRA Tables 3.2.2-2 and 3.2.2-4 address stainless steel tubing in an environment of treated water greater than 60ºC (>140ºF) in the reactor core isolation cooling (RCIC) system and in the high pressure coolant injection (HPCI) system. The applicant specified the BWR Water Chemistry Program, alone, to manage the aging effect of cracking due to SCC or IGSCC. For these AMR result lines, the applicant referred to LRA Table 3.2.1, item 3.2.1-18, and cited generic note A, indicating that the results are consistent with the GALL Report. The applicant also included a plant-specific note stating that these results apply only to stainless steel tubing in the steam supply to RCIC and HPCI pump turbines up to the steam admission valves that are maintained at temperature >140 ºF.

The staff noted that for the corresponding line in SRP-LR Table 3.2-1 and in GALL Report, Volume 1, Table 2, the recommended AMPs are the BWR Stress Corrosion Cracking program and the Water Chemistry program. The staff also noted that the BWR Stress Corrosion Cracking program applies only to stainless steel piping components that are greater than 4 inch nominal pipe size; and therefore, it is not applicable for stainless steel tubing. Because the applicant did not recommend an inspection activity to confirm effectiveness of the BWR Water Chemistry program in mitigating cracking in the stainless steel tubing exposed to treated water, the staff issued RAI 3.2-1, in a letter dated July 15, 2008, asking the applicant to provide a technical justification that confirmation of BWR Water Chemistry Program effectiveness is not needed for these components, and to justify the use of generic note A for these AMR results.

In its response to RAI 3.2-1 dated August 15, 2008, the applicant provided the following response:

> For the AMR results listed in LRA Tables 3.2.2-2 and 3.2.2-4 for stainless steel tubing in a treated water environment and with an aging effect of cracking, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection provides confirmation of the effectiveness of the BWR Water Chemistry Program in managing the effects of aging, including cracking of susceptible materials. Also, as discussed below, the use of note A is not appropriate.
>
> These AMR results are compared to GALL Report, item V.D2-29, for which the AMP is identified as GALL AMP XI.M7, “BWR Stress Corrosion Cracking,” and GALL AMP XI.M2, “Water Chemistry.” As described in plant specific note 0207, the BWR Stress Corrosion Cracking program is applicable only to stainless steel piping (≥4 inch), pump casings, valve bodies, and reactor vessel attachments containing reactor coolant at >200ºF. Therefore, the BWR Stress Corrosion Cracking program is not credited with managing cracking of stainless steel tubing exposed to treated water in the RCIC and HPCI systems. Instead, the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection are credited, and note E is used instead of note A.
>
> LRA Tables 3.2.1, 3.2.2-2, and 3.2.2-4, and the plant-specific note 0207 for the tables in LRA Section 3.2 are revised to reflect these results.

The staff reviewed the applicant’s response and the associated LRA changes. The staff reviewed the applicant’s BWR Water Chemistry Program. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provided mitigation for the aging effect of cracking due to SCC and IGSCC. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and includes methodology that is capable of detecting cracking due to SCC and IGSCC, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection for cracking due to SCC or IGSCC, the staff finds the applicant's proposed AMPs for managing the aging effect of cracking due to SCC or IGSCC in stainless steel tubing exposed to treated water >60ºC (>140ºF) in the RCIC system and in the HPCI system to be acceptable. On this basis, the staff finds that the issue raised in RAI 3.2-1 is resolved by the applicant's changes in the LRA.

3.2.2.1.5 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

LRA Table 3.2.2-1 addresses carbon steel residual heat removal (RHR) heat exchanger shells, shell covers and tube sheets in a treated water environment. The applicant specified use of the BWR Water Chemistry Program, alone, for managing the aging effect of loss of material due to general, pitting, crevice, and galvanic corrosion. For these AMR results the applicant referred to LRA Table 3.2.1, Item 3.2.1-27, and cited generic note E, indicating that the result is consistent with the corresponding GALL Report item for material, environment and aging effect, but a different AMP is credited. The staff noted that for the corresponding line in SRP-LR Table 3.2-1 and in GALL Report, Volume 1, Table 2, the recommended AMP is GALL AMP XI.M21, "Closed-Cycle Cooling Water System," which includes both preventive measures, such as control of water chemistry to minimize corrosion and SSC, and testing and inspection to monitor the effect of corrosion and SSC on the intended function of the components.

LRA Table 3.2.2-2 addresses stainless steel reactor core isolation cooling (RCIC) turbine lube oil cooler tubes, tube sheets and channels in a treated water environment. The applicant specified use of the BWR Water Chemistry Program, alone, for managing the aging effect of loss of material due to pitting, and crevice corrosion. For these AMR results the applicant referred to LRA Table 3.2.1, Item 3.2.1-28, and cited generic note E, indicating that the result is consistent with the corresponding GALL Report item for material, environment and aging effect, but a different AMP is credited. The staff noted that for the corresponding line in SRP-LR Table 3.2-1 and in GALL Report, Volume 1, Table 2, the recommended AMP is GALL AMP XI.M21, "Closed-Cycle Cooling Water System," which includes both preventive measures, such as control of water chemistry to minimize corrosion and SSC, and testing and inspection to monitor the effect of corrosion and SSC on the intended function of the components.

LRA Tables 3.2.2-1, 3.2.2-2, 3.2.2-3 and 3.2.2-4 address copper alloy piping and piping components and heat exchanger tubes in the RHR system, turbine lube oil heat exchanger tubes, tube sheets and channels in the RCIC system, piping and piping components in the core spray system, and lube oil heat exchanger tubes, tube sheets and channels in the high pressure coolant injection (HPCI) system; all of these components are in a treated water environment. The applicant specified use of the BWR Water Chemistry Program, alone, for managing the aging effect of loss of material due to pitting, crevice and galvanic corrosion. For these AMR result lines, the applicant referred to LRA Table 3.2.1, item 3.2.1-29 and cited generic note E, indicating that the result is consistent with the corresponding GALL Report item for material, environment and aging effect, but a different AMP is credited. The staff noted that for the corresponding line in SRP-LR Table 3.2-1 and in GALL Report, Volume 1, Table 2, the recommended AMP is GALL AMP XI.M21, "Closed-Cycle Cooling Water System," which includes both preventive measures, such as control of water chemistry, to minimize corrosion and SSC, and testing and inspection to monitor the effect of corrosion and SSC on the intended function of the components.

For the AMR results described in the preceding paragraphs, because the applicant proposed use of the BWR Water Chemistry Program, alone, and no inspection activity was credited to monitor effectiveness of the water chemistry program, the staff issued RAI 3.2-2, in a letter dated July, 15, 2008, addressing these AMR results and asking the applicant to justify why an inspection is not performed to verify the effectiveness of the water chemistry program and confirm that loss of material is not occurring in these components.

In a letter dated August 15, 2008, the applicant responded to RAI 3.2-2 by providing the following response:

> For the AMR results listed in LRA Tables 3.2.2-1, 3.2.2-2, 3.2.2-3 and 3.2.2-4 that reference the LRA Table 1 items 3.2.1-27, 3.2.1-28 or 3.2.1-29, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of the BWR Water Chemistry Program in managing the effects of aging, including loss of material.
>
> LRA Tables 3.2.1, 3.2.2-1, 3.2.2-2, 3.2.2-3, and 3.2.2-4 are revised to reflect these results.

The staff reviewed the applicant's response and the associated LRA changes. The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to general, pitting, crevice, and galvanic corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to general, pitting, crevice, and galvanic corrosion, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection for loss of material due to general, pitting, crevice, and galvanic corrosion, the staff finds the applicant's LRA changes and the applicant's proposed AMPs for managing the aging effect of aging effect of loss of material due to general, pitting, crevice, and galvanic corrosion in steel, stainless steel, and copper alloy components exposed to closed-cycle cooling water in the residual heat removal system, the reactor core isolation cooling system, the core spray system, and the high pressure coolant injection system to be acceptable. On this basis, the staff finds that the issue raised in RAI 3.2-2 is resolved by the applicant's changes in the LRA.

<u>SER Section 3.2.2.1 Conclusion:</u> 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 OE and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant

has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.2.2.2, the applicant further evaluates of aging management, as recommended by the GALL Report, for the engineered safety features components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to cladding
- loss of material due to pitting and crevice corrosion
- reduction of heat transfer due to fouling
- hardening and loss of strength due to elastomer degradation
- loss of material due to erosion
- loss of material due to general corrosion and fouling
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and MIC
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed the applicant’s evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant’s further evaluations against the criteria contained in SRP-LR Section 3.2.2.2. The staff’s review of the applicant’s further evaluation follows.

3.2.2.2.1 Cumulative Fatigue Damage

LRA Section 3.2.2.2.1 states that fatigue is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff’s review of the applicant’s evaluation of this TLAA.

3.2.2.2.2 Loss of Material Due to Cladding Breach

The staff reviewed LRA Section 3.2.2.2.2 against the criteria in SRP-LR Section 3.2.2.2.2.

LRA Section 3.2.2.2.2 addresses loss of material and cladding breach. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.2.2.2.2 states that loss of material due to cladding breach may occur in PWR steel pump casings with stainless steel cladding exposed to treated borated water.

The staff confirmed in SRP-LR Table 3.2-1, Item 2, is only applicable to PWR plants.

Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.2.2.2.2 does not apply to SSES.

Based on the above, the staff concludes SRP-LR Section 3.2.2.2.2 criteria are not applicable.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.2.2.2.3 against the following criteria in SRP-LR Section 3.2.2.2.3:

(1) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in containment isolation piping, piping components, and piping elements at locations with stagnant flow conditions. The applicant stated that containment isolation piping and components were grouped with similar piping having the same material, environment, aging effects, and aging management program(s). As stated in Table 3.2.1, the SSES components matching the description of LRA item number 3.2.1-03 were included in the evaluation of components for LRA item number 3.2.1-05. Refer to Section 3.2.2.2.3.3 for the details of the evaluation of aging management for these components.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur on internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

Because the grouped components have identical material, environment, aging effect and aging management program(s) recommended in the GALL Report, the staff finds the applicant's grouping of components from LRA Table 3.2.1, item 3.2.1-3, with components in LRA Table 3.2.1, item 3.2.1-5, for the purpose of AMR evaluation to be acceptable. On this basis, the staff finds it acceptable for the applicant to designate LRA Table 3.2.1, item 3.2.1-3 as not applicable.

(2) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in piping, piping components, and piping elements exposed to soil. The applicant stated that this aging effect is not applicable because there are no stainless steel piping, piping components, or piping elements exposed to soil in the ESF systems for SSES.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

LRA table 3.2.1 states that there are no SSES components comparable to LRA item number 3.2.1-04. The applicant stated that there is no buried stainless steel piping or piping components in the ESF Systems and the staff verified the applicant's statement by a review of plant boundary drawings. The staff reviewed LRA Section 2.3.2 and verified that SSES does not have support systems with-in the scope of license renewal that contain the piping, piping components and piping elements fabricated from stainless steel exposed to soil. The applicant stated that no further evaluation is necessary and the staff agrees with that because there is no buried stainless steel piping or piping components in the ESF Systems.

Based on the staff's review as described above and of LRA Section 3.2 and found that there were no stainless steel piping, piping components and piping elements exposed to soil. On the basis of this review, the staff finds that SRP-LR Section 3.2.2.2.3.2 is not applicable to SSES.

(3) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in BWR piping, piping components, and piping elements exposed to treated water. The applicant stated that loss of material due to pitting and crevice corrosion for stainless steel piping components exposed to treated water in ESF Systems is managed by the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection. There are no aluminum piping components subject to aging management review in ESF Systems. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to pitting and crevice corrosion through examination of stainless steel ESF components.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in BWR stainless steel and aluminum piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry for BWRs to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to general, pitting, and crevice corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to pitting and crevice corrosion, if it should occur in the selected components. Based on the applicant's use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the potential aging effect of loss of material due to pitting and crevice corrosion in stainless steel piping components exposed to treated water in the ESF systems to be acceptable.

(4) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that loss of material for stainless steel or copper alloy piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to crevice and pitting corrosion through examination of stainless steel or copper alloy piping components.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation to verify the effectiveness of the lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13, respectively. The staff reviewed the applicant's Lubricating 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 in copper alloy and stainless steel piping, piping components, and piping elements exposed to lubricating oil. The staff verified that the applicant has credited its Lubricating Oil Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program to manage this aging effect for ECCS system. The applicant's AMPS are consistent with those recommended for aging management in SRP-LR Section 3.2.2.2.3, Item #4 and in GALL AMR Items V.D1-24 and V.D2-22.

(5) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in partially encased tanks exposed to raw water. The applicant stated that this aging effect is not applicable because there are no outdoor stainless steel tanks in the ESF systems for SSES.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed. The GALL Report recommends that a plant-specific AMP be evaluated because moisture and water can egress under the tank if the perimeter seal is degraded.

The staff reviewed the applicant's Updated Final Safety Analysis Report (UFSAR) Rev.63 updated in September 2007, to determine the tanks that are relied upon as part of the ESF Systems. Based on the staff's review, the Condensate Storage Tanks are the primary source of water and then transferred to the suppression pool for the ESF Systems. The staff noted from its review that the condensate storage tanks for both Unit 1 and 2 are located outdoors but are not made of stainless steel. The staff verified that both tanks are made of carbon steel.

Based on the staff's review of the applicant's UFSAR, the staff agrees with the applicant's determination that item #5 of SRP-LR Section 3.2.2.2.3 does not apply to SSES ESF systems because there are no stainless steel tanks located outdoors that are relied upon by the ESF systems.

(6) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in piping, piping components, piping elements, and tanks exposed to internal condensation. The applicant stated that this aging effect is not applicable because there are no stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation in the ESF systems for SSES.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

SRP-LR Section 3.2.2.2.3.6 invokes AMR Item 8 in Table 2 of the GALL Report, Volume 1, and AMR Items V.D-2 in the GALL Report, Volume 2, as applicable to stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation in BWR emergency core cooling systems.

The staff reviewed the LRA Table 2s AMR Results for ESF systems and noted that there are no stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation in the ESF systems for SSES. Therefore, the staff concludes that this item is not applicable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.3 criteria. For those line items that apply to LRA Section 3.2.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.2.2.2.4 against the following criteria in SRP-LR Section 3.2.2.2.4:

(1) LRA Section 3.2.2.2.4 addresses reduction of heat transfer due to fouling in heat exchanger tubes exposed to lubricating oil. The applicant stated that For those heat exchangers within the scope of Generic Letter (GL) 89-13 for SSES, the Piping Corrosion Program is credited with managing fouling of heat exchanger tubes exposed

to lubricating oil. For heat exchangers not within the scope of GL 89-13, the Lubricating Oil Analysis Program will manage reduction in heat transfer of heat exchanger tubes exposed to lubricating oil.

SRP-LR Section 3.2.2.2.4 states that reduction of heat transfer due to fouling may occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The existing AMP monitors and controls lube oil chemistry to mitigate reduction of heat transfer due to fouling. However, control of lube oil chemistry may not always be fully effective in precluding fouling; therefore, the effectiveness of lube oil chemistry control should be verified to ensure that fouling does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of lube oil chemistry control. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The Piping Corrosion Program is credited for RHR system motor oil cooler tubes in Table 3.2.2-1. The corresponding GALL Report Volume 2 line item is V.D2-11. For this line item, the GALL Report recommends GALL AMP XI.M39, "Lubricating Oil Analysis", and an effectiveness verification program such as one-time inspection.

Although the external surface of the motor oil cooler tubes is lubricating oil, the internal environment is raw water and this cooler is part of the GL 89-13 program. Therefore, the applicant credits the Piping Corrosion Program. The staff noted that the Piping Corrosion Program is a combination of condition monitoring program (consisting of inspections, surveillances, and testing to detect the presence of, and to assess the extent of, fouling and loss of material) and a mitigation program (consisting of chemical treatments and cleaning activities to minimize fouling and loss of material). The staff's evaluation of the Piping Corrosion program is documented in SER Section 3.0.3.2.6. Because the Piping Corrosion Program includes both the chemistry treatment and cleaning for mitigation and inspection for verification, the staff finds that the Piping Corrosion Program will adequately manage the aging effects of reduction of heat transfer through the period of extended operation.

The Lubricating Oil Analysis Program and Lubricating Oil Inspection Program is credited for RCIC turbine lube oil cooler tubes in Table 3.2.2-2, lube oil cooler tubers in Table 3.2.2-4 and heat exchanger tubes in Table 3.3.2-9. The corresponding GALL Report Volume 2 line item is V.D2-11. For these line items, the GALL Report recommends GALL AMP XI.M39, "Lubricating Oil Analysis", and an effectiveness verification program such as one-time inspection.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13, respectively. The staff reviewed the applicant's Lubricating 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 reduction in heat transfer due to fouling in copper alloy and stainless steel heat exchanger tubes exposed to lubricating oil. The staff verified that the applicant has credited its Lubricating Oil Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program to manage this aging effect. The applicant's AMPs are consistent with those recommended for aging management in SRP-LR Section 3.2.2.2.4, Item #1 and in GALL AMR Items V.D1-9 and V.D2-11.

(2) LRA Section 3.2.2.2.4 addresses reduction of heat transfer due to fouling in heat exchanger tubes exposed to treated water. The applicant stated that the Heat Exchanger Inspection activity is a one-time inspection that will detect and characterize reduction in heat transfer of stainless steel heat exchanger tubes exposed to treated water.

SRP-LR Section 3.2.2.2.4 states that reduction of heat transfer due to fouling may occur in stainless steel heat exchanger tubes exposed to treated water. The existing program controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may be inadequate; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

The LRA references this section to RCIC turbine lube oil cooler tubes in the reactor core isolation cooling system and the corresponding GALL Report Volume 2 line item is V.D2-13. For this line item, the GALL Report recommends GALL AMP XI.M21, Closed-Cycle Cooling Water System Program. The GALL AMP XI.M21, Closed-Cycle Cooling Water System, recommends preventive measures to minimize corrosion and testing and inspection to monitor the effects of corrosion, whereas the applicant is proposing only a one-time inspection activity. The staff issued RAI 3.2.2.2.4.2-1 by letter dated July 23, 2008 requesting the applicant to justify how the one-time heat exchanger inspection activity by itself will manage the aging effect of reduction in heat transfer, without preventive measures to minimize corrosion, such as maintaining treated water chemistry control.

In its response to RAI 3.2.2.2.4.2-1 dated August 22, 2008, the applicant stated that the BWR Water Chemistry Program is credited for managing loss of material for stainless steel heat exchanger tubes exposed to treated water. The applicant also stated that since the BWR Water Chemistry Program does not contain measures for detection of aging effects through inspection, it is not credited for managing reduction in heat transfer; however, it is recognized that the same preventive actions by which the water chemistry program manages loss of material also mitigates the conditions that could result in reduction in heat transfer. The applicant further stated that due to the BWR water chemistry control, fouling of heat exchanger tubes is not expected to occur. Therefore, the applicant concluded that as stated in LRA Section B.2.24, the Heat Exchanger Inspection will provide direct evidence as to whether, and to what extent, reduction in heat transfer has occurred, or is likely to occur, that could result in a loss of intended function.

The staff confirmed that in LRA Table 3.2.2-2, BWR Water Chemistry Program is credited for managing loss of material of RCIC turbine oil coolers. For these same coolers, the applicant has credited the Heat Exchanger Inspection Program for reduction of heat transfer. The staff's evaluation of the Heat Exchanger Program is documented in SER Section 3.0.3.1.12. The Heat Exchanger Inspection Program uses visual (VT-3 or equivalent) or remote visual inspection techniques to verify the absence of, or to identify the extent of fouling on the tube surfaces. On the basis that water chemistry is maintained to minimize corrosion and fouling, the staff finds the use of the Heat Exchanger Inspection Program acceptable for managing the aging effects of reduction of heat transfer for stainless steel heat exchanger tubes exposed to treated water and finds the applicant response acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.4 criteria. For those line items that apply to LRA Section 3.2.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.2.2.2.5 against the criteria in SRP-LR Section 3.2.2.2.5.

LRA Section 3.2.2.2.5 addresses hardening and loss of strength due to elastomer degradation. The applicant stated that the System Walkdown Program is credited with managing degradation due to aging of the visible external surfaces, and in some cases the internal surfaces, of these components.

SRP-LR Section 3.2.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of the BWR standby gas treatment system ductwork and filters exposed to air - indoor uncontrolled. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

SRP-LR Section 3.2.2.2.5 invokes AMR Item 11 in Table 2 of the GALL Report, Volume 1, and AMR Items V.B-4 in the GALL Report, Volume 2, as applicable to elastomeric seals and components in SGTS. In these AMRs, the staff identifies that hardening and loss of strength due to elastomer degradation may occur in elastomeric seal or component surfaces that are exposed either internally or externally to uncontrolled indoor air. In these AMRs, the GALL Report recommends that a plant-specific aging management program is to be evaluated and credited to manage hardening and loss of strength in the elastomer seal surfaces that are exposed either internally or externally to indoor air.

The staff noted that in the applicant's AMR for these components, as given in LRA Table 3.2.2-7, the applicant identified that the flexible connections in the SGTS ductwork are the applicable SGTS components falling within the scope of this assessment and that neoprene is the applicable elastomeric material (rubber). The applicant also identified that the neoprene flexible connections are exposed internally to a ventilation environment and externally to uncontrolled indoor air. The applicant stated that is crediting its Systems Walkdown Program to manage hardening and loss of strength in these materials.

The staff noted that, in AMP B.2.32, the applicant stated that the purpose of the System Walkdown Program is, in part, to manage cracking and/or change in material properties for elastomers (neoprene and rubber) and polymers (Teflon) that are exposed to indoor air or ventilation environments. The staff noted the GALL AMP XI.M36, "External Surfaces Monitoring," is the program in the GALL Report that corresponds to the applicant's System

Walkdown Program. The staff reviewed the program description and program elements for GALL AMP XI.M36 and noted that the scope of this AMP is currently limited to the inspection of steel (i.e., carbon steel, alloy steel, or cast iron) components in order to manage: (1) loss of material that may occur in the steel components as a result of general corrosion, pitting corrosion, or crevice corrosion, or (2) cracking in the coatings that may line the external surfaces of these steel components. The staff noted that GALL AMP XI.M36, "External Surfaces Monitoring," does not apply to elastomeric components or to the management of hardening or loss of strength in elastomeric components. Thus, the staff had several issues with the applicant's AMR for the SGTS neoprene flexible connections and with crediting the Systems Walkdown Program to manage hardening and loss of strength in these elastomeric components.

With respect to the first issue taken on the applicant's AMR, the staff noted that in the applicant's AMRs on management of changes in material properties for the neoprene flexible SGTS connections, the applicant credited its Systems Walkdown Program with aging management of both the internal surfaces that are exposed to the ventilation environment and the external surfaces that are exposed to the uncontrolled indoor air environment. In contrast, the staff noted that scope of GALL AMP XI.M36, "External Surfaces Monitoring," does not include elastomeric components nor does it apply to the management of changes in material properties (such as hardening and loss of strength) that may occur in elastomeric components. The staff also noted the "scope of program" program element in GALL AMP XI.M36, "External Surfaces Monitoring," states that programs corresponding to GALL AMP XI.M36 may only be applied to internal surfaces if the "material and environment combinations are the same for internal and external surfaces such that external surface condition is representative of internal surface condition, and that when credited for internal surfaces, "the program should describe the component internal environment and the credited similar external component environment inspected." In RAI B.2.32-4 by letter dated July 23, 2008, the staff asked the applicant to justify its basis for crediting the System Walkdown Program to manage cracking and changes in material properties that may occur in the external surfaces of in-scope components that are fabricated from either an elastomeric or polymeric material. The staff also asked the applicant to clarify how a visual examination alone from the external surfaces of these materials would be capable of detecting the following aging effects: (1) a tightly configured crack that penetrates the external surface of the component, (2) a subsurface crack or a crack that only penetrates the internal surface of the materials, and (3) a change in a material property, such as a potential change in the hardness property or strength property for the elastomer or polymer material used to fabricate the component. RAI B.2.32-4 is relevant to the acceptance of the applicant's internal and external surface AMRs for the neoprene flexible SGTS connections. The applicant's RAI B2.32-4 response is evaluated and accepted by the staff and documented in SER Section 3.0.3.2.14.

With respect to the second issue taken on the applicant's AMR, the staff noted that in AMP B.2.32, System Walkdown Program, the applicant credits the program, in part, for aging management of both cracking and changes in material properties for elastomer (i.e., neoprene or rubber) and plastic (polymer) components that are exposed to uncontrolled indoor air or ventilation environments. The staff noted, however, that in LRA Table 3.2.2-7, the applicant did not provide either a plant specific AMR or enhanced AMR aligning to GALL AMR V.B-4 that identified cracking as an applicable aging effect requiring management for the flexible neoprene SGTS connections that are exposed internally to the ventilation environment or externally to the uncontrolled indoor air environment. In RAI #3.2.2.2.5-1 by letter dated July 23, 2008, the staff asked the applicant to justify why LRA Table 3.2.2-7 did not include any AMRs on cracking of the neoprene flexible SGTS connections that are exposed internally to the ventilation environment or externally to the uncontrolled indoor air environment, when LRA AMP B.2.32 implies that cracking could occur in these neoprene components. Alternatively, if cracking is an applicable aging effect requiring management for the internal and external surfaces of these flexible SGTS connections, the staff requested the applicant in the RAI to amend the LRA to include AMR's that identify cracking as an AERM for the internal and external surfaces of the components, and to clarify which AMP or AMPs would be credited with the management of cracking in the neoprene flexible SGTS connection surfaces that are exposed to uncontrolled indoor air and to the ventilation environment.

In its response to RAI 3.2.2.2.5-1 dated August 27, 2008, the applicant stated that in Table 3.2.2-7, cracking was inadvertently omitted from the "Aging Effect Requiring Management" column. The applicant amended the LRA to revise Table 3.2.2-7 to add the aging effect of cracking for neoprene flexible connections in an internal environment of ventilation and an external environment of indoor air, and credited the System Walkdown Program to manage this aging effect. The applicant also revised LRA Section 3.2.2.2.5 to state that because the relevant conditions for aging that exist in the internal environment are essentially the same as those that exist in the external environment, the System Walkdown Program is also credited with managing degradation due to aging of the internal surfaces.

The staff finds the response acceptable because the applicant added the aging effect of cracking for neoprene flexible connections and explained why the System Walkdown Program, which is for inspection of external surfaces, is also credited for managing degradation of internal surfaces of the flexible connections. The staff's review of the System Walkdown Program is documented in SER Section 3.0.3.2.14.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.5 criteria. For those line items that apply to LRA Section 3.2.2.2.5, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.6 Loss of Material Due to Erosion

The staff reviewed LRA Section 3.2.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6.

LRA Section 3.2.2.2.6 addresses loss of material due to erosion. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.2.2.2.6 states that loss of material due to erosion may occur in the stainless steel high-pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water.

The staff confirmed in SRP-LR Table 3.2-1, Item 12, is only applicable to PWR plants.

Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.2.2.2.6 does not apply to SSES.

Based on the above, the staff concludes SRP-LR Section 3.2.2.2.6 criteria are 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.

LRA Section 3.2.2.2.7 addresses loss of material due to general corrosion and fouling. The applicant stated that this aging effect is not applicable because SSES nozzles used for containment spray are formed of stainless steel. Stainless steel flow elements are used in place of flow orifices.

SRP-LR Section 3.2.2.2.7 states that loss of material due to general corrosion and fouling may occur on steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled and may cause plugging of the spray nozzles and flow orifices. This aging mechanism and effect will apply since the spray nozzles and flow orifices are occasionally wetted even though this system is mostly on standby. The wetting and drying of these components can accelerate corrosion and fouling. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

SRP-LR Section 3.2.2.2.7 invokes AMR Item 13 in Table 2 of the GALL Report, Volume 1, and AMR Items V.D-1 in the GALL Report, Volume 2, as applicable to steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled in BWR emergency core cooling systems.

The staff finds this item is not applicable because SSES nozzles and flow elements used for containment spray are made of stainless steel, which has no aging effects requiring management in an air-indoor uncontrolled environment as identified by the GALL Report item V.F-12.

Based on the above, the staff concludes SRP-LR Section 3.2.2.2.7 criteria are not applicable.

3.2.2.2.8 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.2.2.2.8 against the following criteria in SRP-LR Section 3.2.2.2.8:

(1) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion in BWR piping, piping components, and piping elements. The applicant stated that loss of material due to general, pitting, and crevice corrosion for steel piping components exposed to treated water is managed by the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components.

    SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur in BWR steel piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry for BWRs to mitigate degradation. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to general, pitting and crevice corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to general, pitting or crevice corrosion, if it should occur in the selected components. Based on the applicant's use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the potential aging effect of loss of material due to general, pitting or crevice corrosion in steel piping, piping components and piping elements exposed to treated water in the ESF systems to be acceptable.

(2) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion in piping, piping components, and piping elements exposed to treated water. The applicant stated that containment isolation piping and components are grouped with similar piping having the same material, environment, aging effects, and aging management program(s). As stated in Table 3.2.1, the SSES components matching the description of LRA item number 3.2.1-15 are included in the evaluation of components for LRA item number 3.2.1-14. Refer to Section 3.2.2.2.8.1 for the details of the evaluation of aging management for these components.

SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur on the internal surfaces of steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

Because the grouped components have identical material, environment, aging effect and aging management program(s) recommended in the GALL Report, the staff finds the applicant's grouping of components from LRA Table 3.2.1, item 3.2.1-15, with components in LRA Table 3.2.1, item 3.2.1-14, for the purpose of AMR evaluation to be acceptable. On this basis, the staff finds it acceptable for the applicant to designate LRA

Table 3.2.1, item 3.2.1 15 as not applicable.

(3) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion in piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that loss of material for steel piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components.

SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13 respectively. The staff reviewed the applicant's Lubricating 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 in steel piping, piping components, and piping elements exposed to lubricating oil. The staff verified that the applicant has credited its Lubricating Oil Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program to manage this aging effect for ECCS system. The applicant's AMPS are consistent with those recommended for aging management in SRP-LR Section 3.2.2.2.8, Item #3 and in GALL AMR Item V.D2-30.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.8 criteria. For those line items that apply to LRA Section 3.2.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.2.2.2.9 against the criteria in SRP-LR Section 3.2.2.2.9.

LRA Section 3.2.2.2.9 addresses loss of material due to general, pitting, crevice, and MIC. The applicant stated that this aging effect is not applicable because there are no steel piping, piping components, or piping elements exposed to soil in the ESF systems for SSES.

SRP-LR Section 3.2.2.2.9 states that loss of material due to general, pitting, crevice, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. Buried piping and tanks inspection programs rely on industry practice, frequency of pipe excavation, and OE to manage the aging effects of loss of material from general, pitting, and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified by evaluation of an applicant's inspection frequency and OE with buried components to ensure that loss of material does not occur.

The staff reviewed the UFSAR for SSES and verified that the SSES design does not include any ESF components that are buried or are exposed to soil. Based on this review, the staff concludes that the applicant has provided an acceptable basis for concluding that the staff's guidance in SRP-LR Section 3.2.2.2.9, and the AMR items in GALL referenced by this SRP-LR section, because the ESF design does not include any components that are exposed to a soil environment or that are buried.

Based on the above, the staff concludes SRP-LR Section 3.2.2.2.9 criteria is not applicable.

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.2.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.2.2-1 through 3.2.2-7, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.2.2-1 through 3.2.2-7, the applicant indicated, via notes F through J that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.2.2.3.1 Aging Management Review Results - Residual Heat Removal System –
LRA Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes the results of AMR evaluations for the RHR system component groups.

In LRA Table 3.2.2-1, the applicant proposed to manage loss of material in copper alloy heat exchanger tubes and tube sheets in an internal environment of raw water by using the Piping Corrosion Program. The applicant referenced footnote G for this line item indicating that environment is not in the GALL Report for this component. However, the staff noted that GALL Report item VII.C1-3 has the same component, material, environment and aging effect combination and recommends GALL AMP XI.M20, Open-Cycle Cooling Water System. The applicant's Piping Corrosion Program is consistent with GALL AMP XI.M20. The staff's evaluation of the Piping Corrosion Program is documented in SER Section 3.0.3.2.6. On the basis that this line item is consistent with GALL Report line item VII.C1-3, the staff finds that the Piping Corrosion Program will adequately manage the aging effect of loss of material in copper alloy heat exchanger tubes and tube sheets in an internal environment of raw water through the period of extended operation.

In LRA Table 3.2.2-1, the applicant proposed to manage reduction of heat transfer in copper alloy heat exchanger tubes in an internal environment of raw water by using the Piping Corrosion Program. The applicant referenced footnote G for this line item indicating that environment is not in the GALL Report for this component. However, the staff noted that GALL Report item VII.C1-6 has the same component, material, environment and aging effect combination and recommends GALL AMP XI.M20, Open-Cycle Cooling Water System. The applicant's Piping Corrosion Program is consistent with GALL AMP XI.M20. The staff's evaluation of the Piping Corrosion Program is documented in SER Section 3.0.3.2.6. On the basis that this line item is consistent with GALL Report line item VII.C1-6, the staff finds that the Piping Corrosion Program will adequately manage the aging effect of reduction of heat transfer in copper alloy heat exchanger tubes in an internal environment of raw water through the period of extended operation.

In LRA Table 3.2.2-1, the applicant proposed to manage loss of material in nickel based alloy heat exchanger tube plugs in an internal environment of raw water by using the Piping Corrosion Program. The applicant referenced footnote G for this line item indicating that environment is not in the GALL Report for this component. The staff noted that nickel based alloy is not included in the GALL Report, however, it is a similar material to the copper alloy material identified in GALL Report item VII.C-3 for the same component, environment and aging effect combination. The GALL Report recommends AMP XI.M20, Open-Cycle Cooling Water System, for item VII.C3. The applicant's Piping Corrosion Program is consistent with GALL AMP XI.M20. The staff's evaluation of the Piping Corrosion Program is documented in SER Section 3.0.3.2.6. On the basis that line item in Table 3.2.2-1 is similar to the GALL Report item VII.C-3, the staff finds that the Piping Corrosion Program will adequately manage the aging effect of loss of material in nickel based alloy heat exchanger tube plugs in an internal environment of raw water through the period of extended operation.

In LRA Table 3.2.2-1, the applicant proposed to manage loss of material of carbon steel piping in an external environment of indoor air by using the Supplementary Piping/Tank Inspection Program. The applicant referenced footnote "H" for this line item indicating that aging effect is not in NUREG-1801 for this component, material and environment combination. The applicant also referenced footnote 0203 indicating that this is in an aggressive air/water interface environment.The definition of footnote "H" implies that these line items are not consistent with GALL Report. However, the LRA has also referenced GALL Report item V.D2-2 and Table 3.2.1, line item 3.2.1-31. The staff issued RAI 3.2.2.3.1-1 in a letter dated July 23, 2008, to request the applicant to justify why a GALL Report and Table 1 item is identified if the line item is not consistent with the GALL Report.

In its letter dated August 22, 2008, in response to RAI 3.2.2.3.1-1, the applicant responded that the note H was used incorrectly in LRA Table 3.2.2-1; instead, note E should have been used. The applicant also stated that this is consistent with the use of note E for a similar component, material and environment combination in Table 3.2.2-2. The applicant revised the LRA Table 3.2.2-1 to change the note from note H to Note E. The evaluation of this line item is documented in SER Section 3.2.2.1.3.

In LRA Tables 3.2.2-1 the applicant proposed to manage cracking in copper alloy piping and piping components in an environment of treated water by using the BWR Water Chemistry Program, alone. The applicant cited generic note H for these AMR results, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. In a letter dated July 15, 2008, the staff issued RAI 3.2-3, applicable for these AMR results and for similar AMR results in LRA Tables 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3. The RAI asked the applicant to provide a technical justification as to why an inspection program, such as the Chemistry Program Effectiveness Inspection is not needed to confirm that the BWR Water Chemistry Program is effective in preventing the aging effect.

In a letter dated August 15, 2008, the applicant responded to RAI 3.2-3 by providing the following response:

> For the five AMR results lines listed in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3, where the material is copper alloy, the environment is treated water (internal), and the aging effect is cracking, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of this program in managing the effects of aging, including cracking in susceptible materials.
>
> LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3 are revised to reflect these results.

The staff reviewed the applicant’s response and the associated LRA changes. The staff reviewed the applicant’s BWR Water Chemistry Program. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking due to stress corrosion cracking. The staff reviewed the applicant’s Chemistry Program Effectiveness Inspection. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report’s recommendations for AMP XI.M32, “One-Time Inspection.” The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and uses examination techniques that are capable of detecting cracking, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection of the aging effect if it should occur, the staff finds the applicant’s proposed AMPs for managing the potential aging effect of cracking due to stress corrosion cracking in copper alloy piping and piping components exposed to treated water in the residual heat removal system to be acceptable. On this basis, the staff finds that the issue raised in RAI 3.2-3 is resolved by the applicant’s LRA changes.

LRA Table 3.2.2-1 summarizes the results of AMRs for the Residual Heat Removal System heat exchangers tube plugs constructed from nickel based alloy which do not have an external surface in contact with an environment. Therefore, the environment, aging effect requiring management, and AMRs are not applicable. The staff agrees with this position because these components do not have an external surface in contact with an environment because their external surface is in contact with the inside of the heat exchanger tubes.

The applicant has listed a number of component, material, environment combinations as N/A. Table 3.0-1, "Internal Environments," defines N/A as "N/A internal is used for components for which an internal environment is not applicable (e.g., strainer screens, heat exchanger fins, flow elements)." Table 3.0-2, "External Environments," defines N/A external as "N/A is used for components for which an external environment is not applicable (e.g., tube plugs)."

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.2 Aging Management Review Results - Reactor Core Isolation Cooling – LRA Table 3.2.2-2

The staff reviewed LRA Table 3.2.2-2, which summarizes the results of AMR evaluations for the reactor core isolation cooling component groups.

In LRA Table 3.2.2-2, the applicant proposed to manage cracking in copper alloy turbine lube oil cooler tubes in an internal environment of treated water by using the Heat Exchanger Inspection Program. The applicant referenced footnote H for this line item indicating that aging effect is not in NUREG-1801 for this component, material and environment combination.

The Heat Exchanger Inspection will use volumetric (RT or UT) to verify the absence of, or to identify the extent of, SCC on the internal surfaces of the copper alloy (admiralty brass) tubes that are exposed to the treated water environment. The staff's evaluation of the Heat Exchanger Inspection Program is documented in SER Section 3.0.3.1.12. Because the treated water environment is less than 140oF, cracking in copper alloy components is of very low probability, and therefore, the staff finds a one-time inspection activity that performs volumetric examination to verify the absence of cracking is an adequate aging management program. On this basis, the staff finds the Heat Exchanger Inspection Program will adequately manage the aging effects of cracking in copper alloy heat exchanger tubes in an internal environment of treated water through the period of extended operation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.3 Aging Management Review Results - Core Spray System – LRA Table 3.2.2-3

The staff reviewed LRA Table 3.2.2-3, which summarizes the results of AMR evaluations for the core spray system component groups.

In LRA Tables 3.2.2-3 the applicant proposed to manage cracking in copper alloy piping and piping components in an environment of treated water by using the BWR Water Chemistry Program, alone. The applicant cited generic note H for these AMR results, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. In a letter dated July 15, 2008, the staff issued RAI 3.2-3, applicable for these AMR results and for similar AMR results in LRA Tables 3.2.2-1, 3.3.2-3, 3.3.2-25, and 3.4.2-3. The RAI asked the applicant to provide a technical justification as to why an inspection program, such as the Chemistry Program Effectiveness Inspection is not needed to confirm that the BWR Water Chemistry Program is effective in preventing the aging effect.

In a letter dated August 15, 2008, the applicant responded to RAI 3.2-3 by providing the following response:

> For the five AMR results lines listed in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3, where the material is copper alloy, the environment is treated water (internal), and the aging effect is cracking, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of this program in managing the effects of aging, including cracking in susceptible materials.
>
> LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3 are revised to reflect these results.

The staff reviewed the applicant's response and the associated LRA changes. The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking due to stress corrosion cracking. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and uses examination techniques that are capable of detecting cracking, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection of the aging effect if it should occur, the staff finds the applicant's proposed AMPs for managing the potential aging effect of cracking due to stress corrosion cracking in copper alloy piping and piping components exposed to treated water in the core spray system to be acceptable. On this basis, the staff finds that the issue raised in RAI 3.2-3 is resolved by the applicant's LRA changes.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.4 Aging Management Review Results - High Pressure Coolant Injection System – LRA Table 3.2.2-4

The staff reviewed LRA Table 3.2.2-4, which summarizes the results of AMR evaluations for the high pressure coolant injection system component groups.

In LRA Table 3.2.2-4, the applicant proposed to manage cracking in copper alloy turbine lube oil cooler tubes in an internal environment of treated water by using the Heat Exchanger Inspection Program. The applicant referenced footnote H for this line item indicating that aging effect is not in NUREG-1801 for this component, material and environment combination.

The Heat Exchanger Inspection will use volumetric (RT or UT) to verify the absence of, or to identify the extent of, SCC on the internal surfaces of the copper alloy (admiralty brass) tubes that are exposed to the treated water environment. The staff's evaluation of the Heat Exchanger Inspection Program is documented in SER Section 3.0.3.1.12. Because the treated water environment is less than 140^{o}F, cracking in copper alloy components is of very low probability, and therefore, the staff finds a one-time inspection activity that performs volumetric examination to verify the absence of cracking is an adequate aging management program. On this basis, the staff finds the Heat Exchanger Inspection Program will adequately manage the aging effects of cracking in copper alloy heat exchanger tubes in an internal environment of treated water through the period of extended operation.

In LRA Table 3.2.2-4, the applicant identifies that there are no applicable aging effects requiring management (AERMs) for synthetic rubber flexible connections (hoses) in the high pressure coolant injection (HPCI) system under either internal exposure to the lubricating oil environment or external exposure to the indoor air environment.

The staff noted in the LRA, the applicant appeared to take inconsistent approach to aging management of elastomeric, rubber, polymeric, and glass components in the application because some AMRs for these types of materials the applicant had identified that cracking and changes in material properties were applicable aging effects requiring management (AERMs), whereas in other AMRs the applicant concluded that AERMs were not applicable to the components. In RAI 3.2.2.3-1 by letter dated July 23, 2008, the staff asked the applicant to consolidate its approach to management of aging in the elastomeric, rubber, polymeric, and glass ESF system components with the aging management approach that the applicant had taken for these types of components in the auxiliary systems. In RAI 3.2.2.3-1, Part A, the staff asked the applicant to justify why it had not identified any AERMs for HPCI synthetic rubber component surfaces that are exposed to lubricating oil and to indoor air when cracking and changes in materials had been identified as applicable aging effects for: (1) neoprene and rubber components in the primary containment atmosphere circulation system under exposure to indoor air and to ventilation air, (2) neoprene/fiberglass components in the reactor building HVAC system under exposure to indoor air and to ventilation air, and (3) for Teflon piping in the sampling system (changes in material properties only) under exposure to indoor air. In RAI 3.3.2.3-1, Part B, the staff asked the applicant to identify those material properties and aging effects that could be impacted by exposure of these synthetic rubber materials to the lubricating oil and indoor air environments.

In its letter dated August 27, 2008, in response to RAI 3.2.2.3-1, the applicant provided justification for no aging effects requiring management for HPCI synthetic rubber components that are exposed to lubricating oil and indoor air environment. The applicant stated that a change in material properties and subsequent cracking of elastomers, such as synthetic rubber, could result from exposure to ionizing radiation, high temperatures, or ultraviolet radiation or ozone.

The applicant also stated the following:

> Ionizing radiation is an aging mechanism only if the total integrated dose (TID) exceeds 10E6 rads. The synthetic rubber components are located in the HPCI pump rooms where the maximum expected TID for 60 years, is 5.3x10E4 rads, which is significantly lower than the threshold limit. Similarly, thermal exposure is an applicable aging mechanism if the components are exposed for prolonged periods to a temperature of 95 ^{o}F or higher. The ambient air temperature in the HPCI pump rooms is 60 ^{o}F to 100 ^{o}F. Since there are no significant sources of heat within these rooms, it is reasonable to assume that external surface temperature of the synthetic rubber components will not exceed 95 ^{o}F for a prolonged period of time.
>
> Ultraviolet radiation and ozone are aging mechanisms only if the surface is exposed to ultraviolet radiation and ozone. Furthermore, synthetic rubber has excellent resistance to ultraviolet radiation and ozone. The indoor air and lubricating air environments contain no significant sources of ultraviolet radiation or ozone.

The applicant also stated that aging effects were identified for elastomer components in the other systems identified in the RAI because the components in those systems are expected to be exposed to TID greater than 10E6 rads externally and to temperatures greater than 95^{o}F.

The applicant concluded that since stressors such as ionizing radiation, high temperatures, ultraviolet radiation, and ozone are not likely to be present in the HPCI pump rooms, therefore, no aging effects are identified for the synthetic rubber components exposed to indoor air and lubricating oil environments.

In response to Part B of the RAI, the applicant indicated that based on the justification provided above, no material properties are impacted by exposure of the synthetic rubber materials in the HPCI system to the lubricating oil and indoor air environments. However, the applicant did state that material properties if impacted would include hardening, loss of strength, and in some cases cracking.

The staff reviewed the applicant response and also reviewed the GALL Report, Chapter IX, Definitions for elastomer materials. In the GALL Report, Chapter IX.C, under definition of elastomers, it states that hardening and loss of strength of elastomers can be induced by elevated temperatures (greater than 95^{o}F), and additional aging factors such as exposure to ozone, oxidation, and radiation. On the basis that the applicant has addressed the aging factors and identified that in the HPCI pump room where these components are located, will not be exposed to these aging factors for a prolonged period of time, and because the GALL Report also addresses these aging factors, the staff finds the applicant response acceptable and considers this issue closed.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.5 Aging Management Review Results - Containment and Suppression System – LRA Table 3.2.2-5

The staff reviewed LRA Table 3.2.2-5, which summarizes the results of AMR evaluations for the containment and suppression system component groups. The staff determined that all AMR evaluation results in LRA Table 3.2.2-5 are consistent with the GALL Report.

3.2.2.3.6 Aging Management Review Results - Containment Atmosphere Control System – LRA Table 3.2.2-6

The staff reviewed LRA Table 3.2.2-6, which summarizes the results of AMR evaluations for the containment atmosphere control system component groups. The staff determined that all AMR evaluation results in LRA Table 3.2.2-6 are consistent with the GALL Report.

3.2.2.3.7 Aging Management Review Results - Standby Gas Treatment System – LRA Table 3.2.2-7

The staff reviewed LRA Table 3.2.2-7, which summarizes the results of AMR evaluations for the standby gas treatment system component groups.

In LRA Table 3.2.2-7, the applicant proposed to manage loss of material for galvanized steel material for ductwork components exposed to an external environment of outdoor air using the SSES AMP B.2.32 "System Walkdown Program." The staff noted that the applicant amended its LRA by letter dated September 26, 2008 to add this AMR line item to LRA Table 3.2.2-7.

The AMR line item credits the AMP B.2.32 "System Walkdown Program" to manage loss of material for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in GALL Report for this component, environment and material combination. The staff's evaluation of the AMP B.2.32 "System Walkdown Program" is documented in SER Section 3.0.3.2.15. The staff determined that this program is a condition monitoring program that will detect the aging effect of loss of material for metals, including steel, by periodic surveillance activities and observations of components' external surfaces to detect aging degradation that are with in the scope of license renewal. On the basis that the applicant will be performing periodic visual inspections of these components, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the engineered safety features components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3 <u>Aging Management of Auxiliary Systems</u>

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:

- Building Drains Nonradioactive System
- Containment Instrument Gas System
- Control Rod Drive Hydraulic System
- Control Structure Chilled Water System
- Control Structure HVAC Systems
- Cooling Tower System
- Diesel Fuel Oil System
- Diesel Generator Buildings HVAC Systems
- Diesel Generators System
- Domestic Water System
- Emergency Service Water System
- Essw Pumphouse HVAC System
- Fire Protection System
- Fuel Pool Cooling And Cleanup System And Fuel Pool And Auxiliaries
- Neutron Monitoring System
- Primary Containment Atmosphere Circulation System
- Process And Area Radiation Monitoring System
- Radwaste Liquid System
- Radwaste Solids Handling
- Raw Water Treatment System
- Reactor Building Chilled Water System
- Reactor Building Closed Cooling Water System
- Reactor Building HVAC System
- Reactor Nonnuclear Instrumentation System
- Reactor Water Cleanup System
- Rhr Service Water System
- Sampling System
- Sanitary Drainage
- Service Air System
- Service Water System
- Standby Liquid Control System
- Turbine Building Closed Cooling Water System
- Reactor Recirculation System (NSAS portions)
- Reactor Vessel and Auxiliaries System (NSAS portions)

3.3.1 Summary of Technical Information in the Application

LRA Section 3.3 provides AMR results for the auxiliary systems components and component groups. LRA Table 3.3.1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL Report," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the auxiliary systems components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry OE in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry OE included a review of the GALL Report and OE issues identified since the issuance of the GALL Report.

3.3.2 Staff Evaluation

The staff reviewed LRA Section 3.3 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.3.2.1.
In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.3.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.3.2.2.

The staff also conducted a technical review of the remaining AMRs not consistent with or not addressed in the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.3.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's OE to verify the applicant's claims.

Table 3.3-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.3 and addressed in the GALL Report.

Table 3.3-1 Staff Evaluation for Auxiliary Systems Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel cranes - structural girders exposed to air - indoor uncontrolled (external) (3.3.1-1)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the SRP-LR, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Yes	Not applicable	Not applicable to SSES (See SER Section 3.3.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air - indoor uncontrolled, treated borated water or treated water (3.3.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	TLAA (See SER Section 3.3.2.2.1)
Stainless steel heat exchanger tubes exposed to treated water (3.3.1-3)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable. The applicant addressed these components under GALL Report item number 3.3.1-52. (See SER Section 3.3.2.2.2)
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution > 60°C (> 140°F) (3.3.1-4)	Cracking due to SCC	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable. The normal operating temperature of the Standby Liquid Control System is below 140ºF; and therefore, cracking due to SCC is not an aging effect requiring management. (See SER Section 3.3.2.2.3.1)
Stainless steel and stainless clad steel heat exchanger components exposed to treated water > 60°C (> 140°F) (3.3.1-5)	Cracking due to SCC	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable. The applicant does not have stainless steel or stainless steel clad heat exchangers exposed to treated water >60ºC (>140ºF). RWCU heat exchangers which are exposed to this environment are carbon steel. (See SER Section 3.3.2.2.3.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-6)	Cracking due to SCC	A plant-specific aging management program is to be evaluated.	Yes	Supplemental Piping and Tanks Inspection Program (B.2.28)	See SER Section 3.3.2.2.3.3
Stainless steel non-regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-7)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.3.2.2.4.1)
Stainless steel regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-8)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to SCC and cyclic loading. A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.3.2.2.4.2)
Stainless steel high-pressure pump casing in PWR chemical and volume control system (3.3.1-9)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to SCC and cyclic loading. A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.3.2.2.4.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
High-strength steel closure bolting exposed to air with steam or water leakage. (3.3.1-10)	Cracking due to SCC, cyclic loading	Bolting Integrity. The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes	Not applicable	Not Applicable. High strength steel bolting is not used in the auxiliary systems.
Elastomer seals and components exposed to air - indoor uncontrolled (internal/external) (3.3.1-11)	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes	System Walkdown Program (B.2.32)	Consistent with GALL Report (See SER Section 3.3.2.2.5.1)
Elastomer lining exposed to treated water or treated borated water (3.3.1-12)	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes	Not Applicable	See SER Section 3.3.2.2.5.2
Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water (3.3.1-13)	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	A plant-specific aging management program is to be evaluated.	Yes	BWR Water Chemistry Program (B.2.2)	Consistent with the GALL Report (See SER Section 3.3.2.2.6)
Steel piping, piping component, and piping elements exposed to lubricating oil (3.3.1-14)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B.2.33) and Lubricating Oil Inspection Program (B.2.25)	Consistent with GALL Report (See SER Section 3.3.2.2.7.1)
Steel reactor coolant pump oil collection system piping, tubing, and valve bodies exposed to lubricating oil (3.3.1-15)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not applicable (See SER Section 3.3.2.2.7.1)
Steel reactor coolant pump oil collection system tank exposed to lubricating oil (3.3.1-16)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection to evaluate the thickness of the lower portion of the tank	Yes	Not applicable	Not applicable (See SER Section 3.3.2.2.7.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to treated water (3.3.1-17)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.2.7.2)
Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-18)	Loss of material/general (steel only), pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	System Walkdown Program (B.2.32)	See SER Section 3.3.2.2.7.3
Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil (3.3.1-19)	Loss of material due to general, pitting, crevice, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Buried Piping and Tanks Surveillance (B.2.18) and Buried Piping and Tanks Inspection (B.2.30)	Consistent with GALL Report (See SER Section 3.3.2.2.8)
Steel piping, piping components, piping elements, and tanks exposed to fuel oil (3.3.1-20)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes	Fuel Oil Chemistry Program (B.2.20) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.2.9.1)
Steel heat exchanger components exposed to lubricating oil (3.3.1-21)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis (B.2.33) and Lubricating Oil Inspection (B.2.25)	Consistent with GALL Report (See SER Section 3.3.2.2.9.2)
Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated water (3.3.1-22)	Loss of material due to pitting and crevice corrosion (only for steel after lining/cladding degradation)	Water Chemistry and One-Time Inspection	Yes	Not Applicable	See SER Section 3.3.2.2.10.1

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water (3.3.1-23)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Closed Cooling Water Chemistry Program (B.2.14) and Chemistry Program Effectiveness Inspection (B.2.22) Closed Cooling Water Chemistry Program (B.2.14)	Consistent with GALL Report (See SER Section 3.3.2.2.10.2)
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.3.1-24)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2), and Chemistry Program Effectiveness Inspection (B.2.22), or BWR Water Chemistry Program (B.2.2), or Closed Cooling Water Chemistry Program (B.2.14) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.2.10.2)
Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external) (3.3.1-25)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	System Walkdown (B.2.32), Cooling Units Inspection (B.2.23), and Selective Leaching Inspection (B.2.29)	Consistent with GALL Report (See SER Section 3.3.2.2.10.3)
Copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.3.1-26)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B.2.33) and Lubricating Oil Inspection Program (B.2.25)	Consistent with GALL Report (See SER Section 3.3.2.2.10.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation (3.3.1-27)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	System Walkdown (B.2.32), Cooling Units Inspection (B.2.23), and Supplemental Piping/Tank Inspection (B.2.28)	Consistent with the GALL Report (See SER Section 3.3.2.2.10.5)
Copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal) (3.3.1-28)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Not Applicable	See SER Section 3.3.2.2.10.6
Stainless steel piping, piping components, and piping elements exposed to soil (3.3.1-29)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	See SER Section 3.3.2.2.10.7
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution (3.3.1-30)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.2.10.8)
Copper alloy piping, piping components, and piping elements exposed to treated water (3.3.1-31)	Loss of material due to pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.2.11)
Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil (3.3.1-32)	Loss of material due to pitting, crevice, and MIC	Fuel Oil Chemistry and One-Time Inspection	Yes	Fuel Oil Chemistry Program (B.2.20) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with the GALL Report (See SER Section 3.3.2.2.12.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to lubricating oil (3.3.1-33)	Loss of material due to pitting, crevice, and MIC	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B.2.33) and Lubricating Oil Inspection Program (B.2.25)	Consistent with GALL Report (See SER Section 3.3.2.2.12.2)
Elastomer seals and components exposed to air - indoor uncontrolled (internal or external) (3.3.1-34)	Loss of material due to wear	A plant-specific aging management program is to be evaluated.	Yes	Not Applicable	See SER Section 3.3.2.2.13
Steel with stainless steel cladding pump casing exposed to treated borated water (3.3.1-35)	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC IN 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes	Not applicable	Not applicable to 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	No	Not applicable	Not applicable to SSES (See SER Section 3.3.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-37)	Cracking due to SCC, IGSCC	BWR Reactor Water Cleanup System	No	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.1.2)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-38)	Cracking due to SCC	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Addressed in line item 3.3.1-37 (See SER Section 3.3.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel BWR spent fuel storage racks exposed to treated water > 60°C (> 140°F) (3.3.1-39)	Cracking due to SCC	Water Chemistry	No	Not applicable	Not applicable because spent fuel pool water temperature is maintained well below 60°C (<140°F). This component, material, environment combination does not exist, and the aging effect identified in the GALL Report does not apply.
Steel tanks in diesel fuel oil system exposed to air - outdoor (external) (3.3.1-40)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable	Not applicable to SSES.
High-strength steel closure bolting exposed to air with steam or water leakage (3.3.1-41)	Cracking due to cyclic loading, SCC	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel closure bolting exposed to air with steam or water leakage (3.3.1-42)	Loss of material due to general corrosion	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel bolting and closure bolting exposed to air - indoor uncontrolled (external) or air - outdoor (external) (3.3.1-43)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel compressed air system closure bolting exposed to condensation (3.3.1-44)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-45)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water > 60°C (> 140°F) (3.3.1-46)	Cracking due to SCC	Closed-Cycle Cooling Water System	No	Closed Cooling Water Chemistry Program (B.2.14) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.1.3)
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-47)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Closed Cooling Water Chemistry Program (B.2.14), or Closed Cooling Water Chemistry Program (B.2.14) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (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 (3.3.1-48)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Closed Cooling Water Chemistry Program (B.2.14) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.1.5.)
Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water (3.3.1-49)	Loss of material due to MIC	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.3.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.3.1-50)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Closed Cooling Water Chemistry Program (B.2.14) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.1.6.)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.3.1-51)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Closed Cooling Water Chemistry Program (B.2.14) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.3.2.1.7)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.3.1-52)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Heat Exchanger Inspection (B.2.24)	Consistent with GALL Report
Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal) (3.3.1-53)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	Area-Based NSAS Inspection (B.2.46)	See SER Section 3.3.2.1.9
Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation (3.3.1-54)	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	Area-Based NSAS Inspection (B.2.46)	See SER Section 3.3.2.1.9
Steel ducting closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-55)	Loss of material due to general corrosion	External Surfaces Monitoring	No	System Walkdown Program (B.2.32)	Consistent with GALL Report
Steel HVAC ducting and components external surfaces exposed to air - indoor uncontrolled (external) (3.3.1-56)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Fire Water System Program (B.2.17)	Consistent with GALL Report
Steel piping and components external surfaces exposed to air - indoor uncontrolled (External) (3.3.1-57)	Loss of material due to general corrosion	External Surfaces Monitoring	No	System Walkdown Program (B.2.32)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel external surfaces exposed to air - indoor uncontrolled (external), air - outdoor (external), and condensation (external) (3.3.1-58)	Loss of material due to general corrosion	External Surfaces Monitoring	No	System Walkdown Program (B.2.32) and Selective Leaching Inspection Program (B.2.29)	Consistent with GALL Report
Steel heat exchanger components exposed to air - indoor uncontrolled (external) or air - outdoor (external) (3.3.1-59)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	System Walkdown Program (B.2.32)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - outdoor (external) (3.3.1-60)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	Not applicable	Addressed in line item 3.3.1-58 (See SER Section 3.3.2.1.1)
Elastomer fire barrier penetration seals exposed to air - outdoor or air - indoor uncontrolled (3.3.1-61)	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection	No	Fire Protection (B.2.16)	Consistent with the GALL Report
Aluminum piping, piping components, and piping elements exposed to raw water (3.3.1-62)	Loss of material due to pitting and crevice corrosion	Fire Protection	No	Not applicable	Not applicable to SSES (See SER Section 3.3.2.1.1)
Steel fire rated doors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-63)	Loss of material due to wear	Fire Protection	No	Fire Protection (B.2.16)	Not Consistent with GALL Report (See SER Section 3.5.2.3.10)
Steel piping, piping components, and piping elements exposed to fuel oil (3.3.1-64)	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	No	Fuel Oil Chemistry Program (B.2.20) and Fire Protection Program (B.2.16)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - indoor uncontrolled (3.3.1-65)	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Not applicable	Evaluated in LRA Table 3.5 (See SER Section 3.3.2.1.1)
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - outdoor (3.3.1-66)	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Not applicable	Evaluated in LRA Table 3.5 (See SER Section 3.3.2.1.1)
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-67)	Loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring Program	No	Not applicable	Evaluated in LRA Table 3.5 (See SER Section 3.3.2.1.1)
Steel piping, piping components, and piping elements exposed to raw water (3.3.1-68)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Fire Water System	No	Fire Water System Program (B.2.17)	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-69)	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	No	Fire Water System Program (B.2.17)	Consistent with GALL Report
Copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-70)	Loss of material due to pitting, crevice, and MIC, and fouling	Fire Water System	No	Fire Water System Program (B.2.17)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to moist air or condensation (internal) (3.3.1-71)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Supplemental Piping/Tank Inspection Program (B.2.28)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel HVAC ducting and components internal surfaces exposed to condensation (internal) (3.3.1-72)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) MIC	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Systems Walkdown program (B.2.32)	Consistent with GALL Report (See SER Section 3.3.2.1.8)
Steel crane structural girders in load handling system exposed to air - indoor uncontrolled (external) (3.3.1-73)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Crane Inspection Program (B.2.15)	Consistent with GALL Report
Steel cranes - rails exposed to air - indoor uncontrolled (external) (3.3.1-74)	Loss of material due to wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Not applicable	Evaluated in LRA Table 3.5 (See SER Section 3.3.2.1.1)
Elastomer seals and components exposed to raw water (3.3.1-75)	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	No	Not applicable	Evaluated in LRA Table 3.5 (See SER Section 3.3.2.1.1)
Steel piping, piping components, and piping elements (without lining/ coating or with degraded lining/coating) exposed to raw water (3.3.1-76)	Loss of material due to general, pitting, crevice, and MIC, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Steel heat exchanger components exposed to raw water (3.3.1-77)	Loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-78)	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-79)	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-80)	Loss of material due to pitting, crevice, and MIC	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Copper alloy piping, piping components, and piping elements, exposed to raw water (3.3.1-81)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Copper alloy heat exchanger components exposed to raw water (3.3.1-82)	Loss of material due to pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13)	Consistent with GALL Report
Stainless steel and copper alloy heat exchanger tubes exposed to raw water (3.3.1-83)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Piping Corrosion Program (B.2.13) Heat Exchanger Inspection (B.2.24)	Consistent with GALL Report (See SER Section 3.3.2.1.10)
Copper alloy > 15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water, or closed cycle cooling water (3.3.1-84)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching Inspection Program (B.2.29) and Cooling Units Inspection Program (B.2.23)	Consistent with GALL Report
Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water (3.3.1-85)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching Inspection Program (B.2.29)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Structural steel (new fuel storage rack assembly) exposed to air - indoor uncontrolled (external) (3.3.1-86)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	No	Not applicable	Not applicable to SSES
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water (3.3.1-87)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable	Not applicable to BWRs
Aluminum and copper alloy > 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-88)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Not applicable	Not applicable to 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	No	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 SCC	Water Chemistry	No	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	No	Not applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Galvanized steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (3.3.1-92)	None	None	No	None	Consistent with GALL Report
Glass piping elements exposed to air, air - indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water (3.3.1-93)	None	None	No	None	Consistent with GALL Report
Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.3.1-94)	None	None	No	None	Consistent with GALL Report
Steel and aluminum piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.3.1-95)	None	None	No	None	Consistent with GALL Report
Steel and stainless steel piping, piping components, and piping elements in concrete (3.3.1-96)	None	None	No	None	Consistent with GALL Report
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.3.1-97)	None	None	No	None	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air (3.3.1-98)	None	None	No	None	Consistent with GALL Report
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-99)	None	None	No	Not applicable	Not applicable to BWRs

The staff's review of the auxiliary systems component groups followed any one of several approaches. One approach, documented in SER Section 3.3.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.3.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.3.2.3, reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the auxiliary systems components is documented in SER Section 3.0.3.

3.3.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.3.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the auxiliary systems components:

- BWR Water Chemistry Program
- Flow-Accelerated Corrosion (FAC) Program
- Bolting Integrity Program
- Piping Corrosion Program
- Closed Cooling Water Chemistry Program
- Fire Water System Program
- Buried Piping Surveillance Program
- Fuel Oil Chemistry Program
- Chemistry Program Effectiveness Inspection
- Cooling Units Inspection
- Heat Exchanger Inspection
- Lubricating Oil Inspection
- Monitoring and Collection System Inspection
- Supplemental Piping/Tank Inspection
- Selective Leaching Inspection

- Buried Piping and Tanks Inspection Program
- System Walkdown Program
- Lubricating Oil Analysis Program
- Area-Based NSAS Inspection

LRA Tables 3.3.2-1 through 3.3.2-34 summarize AMRs for the auxiliary systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited

AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the engineered safety features ESF components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.3.1, the applicant’s references to the GALL Report are acceptable and no further staff review is required, with the exception of the following AMRs that the applicant had identified were consistent with the AMRs of the GALL Report and for which the staff felt were in need of additional clarification and assessment. The staff’s evaluations of these AMRs are providing in the subsections that follows.

3.3.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.3.1, item 36, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because Boraflex is not used as a neutron absorber for spent fuel racks at SSES. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no Boraflex as neutron absorber, and uses Boral instead. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.3.1, items 39, the applicant states that for this corresponding AMR result lines in the GALL Report, cracking due to SCC was not identified as an aging effect requiring management for stainless steel spent fuel storage racks because the temperature of the spent fuel pool is maintained well below 140ºF. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that spent fuel temperature is maintained below 140 ºF. In addition, the staff noted that SCC rarely occurs in austenitic stainless steel below 140 ºF (Metals Handbook, 1988). Therefore, the staff agrees finds that the corresponding AMR result lines in the GALL Report is not applicable to SSES.

In LRA Table 3.3.1, item 40, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because steel tanks in the Diesel Fuel Oil System are buried. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no steel tanks exposed to outdoor air in the Diesel Fuel Oil System. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.3.1, items 60, the applicant indicates that for this corresponding AMR result lines in the GALL Report, steel components that are exposed to air - outdoor (external) are evaluated in item 3.3.1-58. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that the components under this commodity group are addressed under item 3.3.1-58. In addition, steel components that are externally exposed to outdoor air are managed by the System Walkdown Program, which is consistent with the GALL Report for this item 3.3.1-60. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result lines in the GALL Report are evaluated elsewhere in the application.

In LRA Table 3.3.1, items 49 and 62, the applicant indicates the component or the aging effects for these line items is not applicable. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that the components and the aging effect under this commodity group are not applicable to SSES. On this basis, the staff agrees with the applicant's corresponding AMR result line in the GALL Report is not applicable to SSES .

In LRA Table 3.3.1, items 65, 66 and 67, the applicant states that for these corresponding AMR result lines in the GALL Report, cracking and spalling were not identified as an aging effects requiring management for reinforced concrete structural fire barriers exposed to indoor or outdoor uncontrolled air. The staff reviewed the documentation supporting the applicant's AMR evaluation and noted that reinforced concrete structural fire barriers were evaluated in the following tables: Table 3.5.2-2, 3.5.2-3, 3.5.2-4, 3.5.2-5, 3.5.2-6, 3.5.2-7, and 3.5.2-8. In addition, the staff noted that though the applicant did not identified cracking and spalling as aging effects, the applicant did manage the components with Structure Monitoring Program and Fire Protection Program, which are consistent with the GALL Report. Therefore, the staff agrees with the applicant's management of the components under 3.3.1 items 65, 66, and 67.

In LRA Table 3.3.1, item 74, the applicant states that for these corresponding AMR result lines in the GALL Report, loss of material due to wear was not identified as an aging effect requiring management for steel cranes - rails exposed to indoor uncontrolled air. The staff reviewed the documentation supporting the applicant's AMR evaluation and noted that steel cranes rails were evaluated in the following tables: Table 3.5.2-2, 3.5.2-4, 3.5.2-6, 3.5.2-7, 3.5.2-8, and 3.5.2-10. In addition, the staff noted that though the applicant did not identified loss of material due to wear as an aging effect, the applicant did manage the components with Crane Inspection Program, which are consistent with the GALL Report. Therefore, the staff agrees with the applicant's management of the components under 3.3.1 item 74.

3.3.2.1.2 Cracking due to Stress Corrosion Cracking (SCC), Intergranular Stress Corrosion Cracking (IGSCC)

LRA Tables 3.3.2-3, 3.3.2-24, 3.3.2-25, 3.3.2-27, and 3.3.2-34 include AMR results for stainless steel components in an environment of treated water with temperature greater than 60ºC (>140ºF) and with an aging effect of cracking due to SCC or IGSCC. There are four AMR result lines in LRA Table 3.3.2-3 where the components are accumulators, filters, piping and valve bodies in the control rod drive hydraulic system; three lines in LRA Table 3.3.2-24 where the components are piping, tubing and valve bodies in the reactor non-nuclear instrumentation system; three lines in LRA Table 3.3.2-25 where the components are orifices, tubing, and piping and piping components in the reactor water cleanup system; one line in LRA Table 3.3.2-27 where the components are piping and piping components in the sampling system; and one line in LRA Table 3.3.2-34 where the components are piping and piping components in the reactor vessel and auxiliaries system (NSAS portions). For these AMR results, the applicant credited use of the BWR Water Chemistry Program, alone, with managing the aging effect. The applicant cited generic Note E, indicating that the result is consistent with the corresponding GALL Report item for material, environment and aging effect, but a different AMP is credited.

The staff noted that for the corresponding line in SRP-LR Table 3.2-1 and in GALL Report, Volume 1, Table 2, the recommended AMP is GALL AMP XI.M25, Closed-Cycle Cooling Water

System, which includes both preventive measures, such as control of water chemistry, to minimize the potential for SCC and IGSCC, and inspection to monitor the effectiveness of the water chemistry program to control cracking due to SCC or IGSCC. Because the applicant recommended the BWR Water Chemistry Program, alone, and no inspection activity credited to monitor effectiveness of the chemistry program, the staff issued RAI 3.3-3 in a letter dated July 15, 2008, asking the applicant to justify why an inspection is not needed to verify the effectiveness of the water chemistry program and confirm that cracking is not occurring in these components.

In a letter dated August 15, 2008, the applicant responded to RAI 3.3-3 by providing the following response:

> For the AMR results identified in LRA Section 3.3 (Tables 3.3.2-3, 3.3.2-24, 3.3.2-25, 3.3.2-27, and 3.3.2-34) that refer to the GALL Report item VII.E3-16, verification of the effectiveness of the BWR Water Chemistry Program is needed to confirm that cracking is not occurring in these components.
>
> The affected LRA Tables are revised to explicitly credit the Chemistry Program Effectiveness Inspection in combination with the BWR Water Chemistry Program.

The staff reviewed the applicant's response and all of the associated LRA changes. The staff noted that for all of the AMR results being questioned by the staff, the applicant revised the AMPs to be the BWR Water Chemistry Program in combination with the Chemistry Program Effectiveness Inspection, rather than the BWR Chemistry Program, alone. The revised AMR result lines continued to cite generic Note E, indicating that the material, environment and aging effect are consistent with the GALL Report, but a different aging management program is credited.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking due to SCC or IGSCC. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and implements inspection methods that are capable of detecting cracking due to SCC or IGSCC, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection of the aging effect if it should occur, the staff finds the applicant's proposed AMPs for managing the potential aging effect of cracking due to SCC or IGSCC for stainless steel piping, piping components, and piping elements exposed to treated water >60ºC (>140ºF) in the control rod drive hydraulics system, the reactor non-nuclear instrumentation system, the reactor water cleanup system, the sampling system, and the reactor vessel and auxiliaries system (NSAS portions) to be acceptable. The staff also finds that the applicant's response to RAI 3.3-3, together with the associated LRA changes, resolves the issues raised in that RAI.

Based on the programs identified and the LRA changes made in response to RAI 3.3-3, the staff concludes that the applicant's AMR results are acceptable because the AMPs provide both detection and mitigation for the aging effect of cracking due to SCC and IGSCC in the subject components. For those items that apply to LRA Table 3.3.1, item 3.3.1-37, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.1.3 Cracking Due to Stress Corrosion Cracking

In LRA Table 3.3.1, Item 3.3.1-46, addresses cracking due to stress corrosion cracking for stainless steel piping, piping components and heat exchanger components with the internal surfaces exposed to treated water greater than 140^{o}F in the Reactor Building Closed Cooling Water System and Sampling System. The GALL Report recommends GALL AMP XI.M21, "Closed-Cycle Cooling Water System" to manage this aging effect. The staff noted that based on the applicant’s response to RAI B.2.14-2 in letter dated August 12, 2008 the applicant amended the LRA so that the AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 also credit AMP B.2.22 “Chemistry Program Effectiveness Inspection” and 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 AMR results lines that reference note E and determines that the material, environment, and aging effect are consistent with the GALL Report.

The staff reviewed the applicant’s AMP B.2.14 “Closed Cooling Water Chemistry Program” and AMP B.2.22 “Chemistry Program Effectiveness Inspection” and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that AMR results addressed by this line item that credit these programs are acceptable.

3.3.2.1.4 Loss of Material Due to General, Pitting and Crevice Corrosion

In LRA Table 3.3.1, Item 3.3.1-47, addresses loss of material due to general, pitting, and crevice corrosion for steel chiller and piping components, tanks, pump casings, valve bodies and unit coolers with the internal surfaces exposed to treated water in the Process and Area Radiation Monitoring System, Reactor Building Chilled Water, HVAC and Closed Cooling Water Systems, and Control Structure Chilled Water and HVAC System. The GALL Report recommends GALL AMP XI.M21, "Closed-Cycle Cooling Water System" to manage this aging effect. The staff noted that based on the applicant’s response to RAI B.2.14-2 in letter dated August 12, 2008 the applicant amended the LRA so that the AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 also credit AMP B.2.22 “Chemistry Program Effectiveness Inspection” and 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 AMR results lines that reference note E and determines that the material, environment, and aging effect are consistent with the GALL

Report. By letter dated December 11, 2008 the applicant supplemented its response to RAI B.2.14-2 in which the applicant stated that the aging effect of loss of material for steel components exposed to a treated water environment in the Diesel Jacket Cooling Water System is managed only by the Closed Cooling Water Chemistry Program because corrosion probes have been installed. Further discussion is provided in SER Section 3.0.3.2.7 in which the applicant responded to RAI B.2.14-3. The applicant's supplemental response provided clarification as to why the Chemistry Program Effectiveness Inspection was not credited for these steel components in the Diesel Jacket Cooling Water System, and these AMR line items are consistent with the GALL Report under GALL AMR Item VII.H2-23.

The staff reviewed the applicant's AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage loss of material and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that AMR results addressed by this line item that credit these programs are acceptable.

3.3.2.1.5 Loss of Material Due to General, Pitting, Crevice and Galvanic Corrosion

In LRA Table 3.3.1, Item 3.3.1-48, addresses loss of material due to general, pitting, crevice and galvanic corrosion for steel chiller and heat exchanger components with the internal surfaces exposed to treated water in the Fuel Pool Cooling System, Containment Instrument Gas System, Reactor Building Chilled Water and Closed Cooling Water Systems, Reactor Water Cleanup System, Sampling System, Turbine Building Closed Cooling Water System and Control Structure Chilled Water System. The GALL Report recommends GALL AMP XI.M21, "Closed-Cycle Cooling Water System" to manage this aging effect. The staff noted that based on the applicant's response to RAI B.2.14-2 in letter dated August 12, 2008 the applicant amended the LRA so that the AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 also credit AMP B.2.22 "Chemistry Program Effectiveness Inspection" and 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 AMR results lines that reference note E and determines that the material, environment, and aging effect are consistent with the GALL Report.

The staff reviewed the applicant's AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 a treated water environment. The staff further noted the Closed Cooling Water Chemistry

Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage loss of material and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that AMR results addressed by this line item that credit these programs are acceptable.

3.3.2.1.6 Loss of Material Due to Pitting and Crevice Corrosion

In LRA Table 3.3.1, Item 3.3.1-50, addresses loss of material due to pitting and crevice corrosion for stainless steel unit cooler, heat exchanger and chiller components, piping components, orifices, pump casings, tubing and valve bodies with the internal surfaces exposed to treated water in the Reactor Building Chilled Water, HVAC and Closed Cooling Water Systems, Sampling System, Diesel Generator Systems (Intake/Exhaust, Jacket Water, Lubricating Oil and NSAS Components) and Control Structure Chilled Water System. The GALL Report recommends GALL AMP XI.M21, "Closed-Cycle Cooling Water System" to manage this aging effect. The staff noted that based on the applicant’s response to RAI B.2.14-2 in letter dated August 12, 2008 and supplemental response to RAI B.2.14-2 by letter dated December 11, 2008 the applicant amended the LRA so that the AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 also credit AMP B.2.22 “Chemistry Program Effectiveness Inspection” and 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 AMR results lines that reference note E and determines that the material, environment, and aging effect are consistent with the GALL Report.

The staff reviewed the applicant’s AMP B.2.14 “Closed Cooling Water Chemistry Program” and AMP B.2.22 “Chemistry Program Effectiveness Inspection” and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 pitting and crevice corrosion for stainless steel components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage loss of material and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that AMR results addressed by this line item that credit these programs are acceptable.

3.3.2.1.7 Loss of Material Due to Pitting, Crevice and Galvanic Corrosion

In LRA Table 3.3.1, Item 3.3.1-51, addresses loss of material due to pitting, crevice and galvanic corrosion for copper and copper alloy chiller and heat exchanger components, piping and piping components and elements with the internal surfaces exposed to treated water in the

Process and Area Radiation Monitoring System, Containment Instrument Gas System, Reactor Building Chilled Water, HVAC and Closed Cooling Water Systems, Sampling System and Control Structure Chilled Water, Diesel Generator Systems (Intake/Exhaust, Jacket Water, Lubricating Oil and NSAS Components) and HVAC System   The GALL Report recommends GALL AMP XI.M21, "Closed-Cycle Cooling Water System" to manage this aging effect. The staff noted that based on the applicant's response to RAI B.2.14-2 in letter dated August 12, 2008 and supplemental response to RAI B.2.14-2 by letter dated December 11, 2008 the applicant amended the LRA so that the AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 also credit AMP B.2.22 "Chemistry Program Effectiveness Inspection" and 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 AMR results lines that reference note E and determines that the material, environment, and aging effect are consistent with the GALL Report.

The staff reviewed the applicant's AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 pitting, crevice, and galvanic corrosion for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage loss of material and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that AMR results addressed by this line item that credit these programs are acceptable.

3.3.2.1.8 Loss of Material Due to General, Pitting, Crevice and Microbiologically-Influenced Corrosion

In LRA Table 3.3.1, Item 3.3.1-72, addresses loss of material due to general, pitting, crevice and microbiologically influenced corrosion for steel HVAC ducting and components internal surfaces exposed to condensation (internal) in the Primary Containment Atmosphere Circulation System. The GALL Report recommends GALL 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 AMR results lines that reference note E and determines that the material, environment, and aging effect are consistent with the GALL Report.

The staff reviewed the applicant's AMP B.2.32 "System Walkdown Program" and its evaluation is documented in SER Sections 3.0.3.2.15. The staff determined that this aging management program which include surveillance activities and observations that are adequate to manage loss of material due to general corrosion for steel components exposed to ventilation (internal) addressed by this AMR are consistent with those activities recommend by GALL AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”. However the applicant is crediting the AMP B.2.32, which performs visual inspections of the external surfaces only, for the internal surfaces of fan and unit cooler housings. The staff felt that additional information was needed and therefore, by letter dated July 23. 2008 the staff issued RAI 3.x.2.1-1 requesting the applicant to justify the basis for crediting AMP B.2.32, which performs visual inspections of external surfaces only, for the internal surfaces of ducting and components internal surfaces exposed to condensation (internal) environments only. The applicant responded to RAI 3.x.2.1-1, in a letter dated August 22, 2008. The applicant stated that the internal ventilation environment of that these components are exposed to is the same as the environment the external surfaces are exposed to because the function of this system is to circulate the air within containment. The staff noted that if condensation were to occur, that it is expected to form on the external surfaces of the components. The applicant further stated that visual inspections of the external surface for loss of material will be conservatively representative of the condition internal surface, because the external surface may be subjected to condensation. The staff noted that this is consistent with the recommendations given in the program element, “scope of program”, of GALL AMP XI.M36 “External Surfaces Monitoring”, in which a visual inspection of the external surfaces may be representative of the internal surfaces if the environment is the same for the external and internal surfaces. The staff noted that for the unit cooler housings the AMP B.2.23 “Cooling Units Inspection” will supplement the AMP B.2.32 “System Walkdown Program” because this component may be subjected to condensation on the internal surface and the staff confirmed that the AMP B.2.23 will provide verification if degradation has occurred on the internal surfaces of this component and the effectiveness of the AMP B.2.32 “System Walkdown Program” for managing loss of material. On the basis of its review, the staff finds the applicable portion of the applicant’s response that references GALL Item VII.F3-3 to be acceptable because (1) the environments of the external surface and internal surface is the same and consistent with the recommendations provided in GALL that an visual inspection of the external surface can be credited for managing aging of the internal surfaces if the environments are the same and (2) the applicant has credited a one-time inspection to verify if degradation has occurred and the effectiveness of the Systems Walkdown Program when condensation may form on the internal surface. On this basis, the staff finds this AMR results for this line item acceptable.

3.3.2.1.9 Loss of Material

LRA Table 3.3.1, line items 3.3.1-53 and 3.3.1-54 address the results of an AMR for steel and stainless steel compressed air piping, piping components, and piping elements exposed internal condensation, respectively. The applicant states that the aging effect requiring management is loss of material and proposes to use the Area-Based NSAS Inspection to manage the effects of aging.

The applicant has indicated generic note E for this line item which is consistent with the GALL report for material, environment, and aging effect, but a different aging management program. The staff noted that the GALL Report recommends GALL AMP XI.M24, “Compressed Air Monitoring.” The applicant cited a plant-specific note which states that internal condensation is collected in strainers, drain traps, tanks and associated piping and this moisture has conservatively been considered a raw water environment, but there is no resulting condensation on the external surface of the components. The staff noted that the applicant referenced the GALL AMR Items VII.D-2 and VII.D-4, which are applicable to compressed air systems, because the component/material/aging effect and environment combination corresponded to those that were applicable to the applicant, noting that the applicant conservatively considered internal condensation as raw water. The staff further noted that the piping and piping components applicable to this AMR that is being addressed here, in the Containment Instrument Gas and Service Air System, is not compressed air.

The staff's evaluation of the Area-Based NSAS Inspection is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting loss of material and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

3.3.2.1.10 Reduction of Heat Transfer due to Fouling

In its letter dated June 30, 2008, in response to RAI B.2.17-2, the applicant amended Table 3.3.2-13, Fire Protection System, to credit the Heat Exchanger Inspection Program to manage the aging effect of reduction of heat transfer due to fouling for copper alloy heat exchanger and oil cooler tubes in raw water internal environment. The applicant applied footnote "E" and referenced GALL Report item VII.C1-6. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M20, "Open-Cycle Cooling Water System," the applicant proposed using the Heat Exchanger Inspection Program. The staff noted that these heat exchangers are not included in the GL 89-13 program and will not therefore be in the scope of the Open-Cycle Cooling Water Program. The applicant instead uses the Fire Water System Program to manage loss of material due to corrosion, MIC or biofouling and includes actions to ensure no significant corrosion, MIC, or biofouling has occurred. However, in addition, the applicant has credited the one-time Heat Exchanger Inspection Program to provide direct evidence as to whether, and to what extent, reduction in heat transfer due to fouling has occurred or is likely to occur that could result in a loss of intended function.

On the basis that the applicant is crediting the Fire Water Inspection Program to ensure no significant fouling is occurring and crediting the Heat Exchanger inspection Program to obtain direct evidence of fouling, the staff finds that implementation of the Heat Exchanger Inspection will ensure that the heat transfer capabilities of the subject heat exchangers, and the pressure boundary integrity of the subject tubes, are maintained consistent with the current licensing basis during the period of extended operation.

In LRA Table 3.3.2-4, the applicant stated that reduction of heat transfer of control structure chilled water chiller evaporator copper and copper alloy tubes in an internal environment of treated water is managed by the Heat Exchanger Inspection Program.

The staff noted that the applicant applied note E to this item. The applicant referenced LRA Table 3.3-1, item 3.3.1-52 and GALL Report Volume 2, item VII.C2-2. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M21, "Closed-Cycle Cooling Water System," the applicant proposed using the Heat Exchanger Inspection Program.

The GALL recommended AMP XI.M21, Closed-Cycle Cooling Water System, recommends preventive measures to minimize corrosion and testing and inspection to monitor the effects of corrosion, whereas the applicant is proposing only a one-time inspection activity. The staff noted that the heat exchangers in question are the chiller evaporators 0S118A/B and chiller oil cooler 0S119A/B. The applicant has credited the Closed-Cycle Cooling Water System program to manage loss of material for these two components and credited the Heat Exchanger Inspection Program to manage reduction of heat transfer. The staff noted that water chemistry is maintained by the Closed-Cycle Cooling Water System Program in accordance with the EPRI guidelines to minimize an aggressive environment. However, the applicant's Closed-Cycle Cooling Water System does not perform inspections for reduction of heat transfer due to fouling. The heat exchanger inspection will provide direct evidence as to whether, and to what extent, reduction in heat transfer due to fouling has occurred or is likely to occur that could result in a loss of intended function. On this basis, the staff finds that the implementation of the Heat Exchanger Inspection will ensure that the heat transfer capabilities of the subject heat exchangers are maintained consistent with the current licensing basis during the period of extended operation.

SER Section 3.3.2.1 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 OE and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.3.2.2, the applicant further evaluates of aging management, as recommended by the GALL Report, for the auxiliary systems components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- reduction of heat transfer due to fouling
- cracking due to SCC
- cracking due to SCC and cyclic loading
- hardening and loss of strength due to elastomer degradation
- reduction of neutron-absorbing capacity and loss of material due to general corrosion
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and MIC
- loss of material due to general, pitting, crevice, MIC and fouling
- loss of material due to pitting and crevice corrosion

- loss of material due to pitting, crevice, and galvanic corrosion
- loss of material due to pitting, crevice, and MIC
- loss of material due to wear
- loss of material due to cladding breach
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.3.2.2. The staff's review of the applicant's further evaluation follows.

3.3.2.2.1 Cumulative Fatigue Damage

LRA Section 3.3.2.2.1 states that fatigue is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

3.3.2.2.2 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.3.2.2.2 against the criteria in SRP-LR Section 3.3.2.2.2.

LRA Section 3.3.2.2.2 addresses reduction of heat transfer due to fouling. The applicant stated that there are no SSES components compared to LRA item number 3.3.1-03. For Auxiliary Systems, stainless steel heat exchanger tubes in treated water are evaluated under LRA item number 3.3.1-52. Fouling of stainless steel heat exchanger tubes in treated water is managed by the Closed Cooling Water Chemistry Program. The Closed Cooling Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. Based on review of plant-specific OE, the Closed Cooling Water Chemistry Program is effective in managing fouling through control of microorganisms and corrosion products.

SRP-LR Section 3.3.2.2.2 states that reduction of heat transfer due to fouling may occur in stainless steel heat exchanger tubes exposed to treated water. The existing program controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may be inadequate; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that LRA Table 3.3.1, item 3.3.1-52 includes the same components, material and aging effect as LRA Table 3.3.1, item 3.3.1-3, and that the closed cycle cooling water environment is also a treated water environment. The staff reviewed the components evaluated under LRA Table 3.3.2, item 3.3.1-52 and noted that the only stainless steel heat exchanger components are for the diesel generator jacket water heat exchangers, which does not include primary water on either side of the heat exchanger tubes. Because the component, material and aging effects are identical and both environments are non-primary treated water, the staff finds it acceptable for the applicant to include the evaluations for LRA Table 3.3.1, item 3.3.1-3, with the evaluations for LRA Table 3.3.1, item 3.3.1-52. On this basis, the staff finds it acceptable to designate LRA Table 3.3.1, item 3.3.1-3 as not applicable.

Based on the above, the staff concludes SRP-LR Section 3.3.2.2.2 criteria is not applicable.

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.3.2.2.3 against the following criteria in SRP-LR Section 3.3.2.2.3:

(1) LRA Section 3.3.2.2.3 addresses cracking due to SCC in the BWR Standby Liquid Control System. The applicant stated that this aging effect is not applicable because the normal operating temperature is below 140℉ during normal plant operation.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in the stainless steel piping, piping components, and piping elements of the BWR SLC system that are exposed to sodium pentaborate solution greater than 60℃ (140℉). The existing AMP monitors and controls water chemistry to manage the aging effects of cracking due to SCC. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause SCC; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that SCC does not occur. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that SCC does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the boundary drawing for the standby liquid control system and confirmed that all components of the system exposed to sodium pentaborate during normal operation are outside the drywell in an area of the reactor building that does not exceed 100ºF during normal operation. The staff also noted that both the GALL Report and the SRP-LR state that the threshold for initiation of cracking due to SCC is a temperature greater than 60ºC (>140ºF). Because ambient temperature of the standby liquid control system components exposed to sodium pentaborate is below 60ºC (<140ºF) during normal plant operation, the staff finds that the aging effect of cracking due to SCC is not applicable for these components. On this basis, the staff finds it acceptable for the applicant to designate LRA Table 3.3.1, item 3.3.1-4 as not applicable.

(2) LRA Section 3.3.2.2.3 addresses cracking due to SCC in heat exchanger components. The applicant stated that this aging effect is not applicable because the heat exchanger components are carbon steel.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 60℃ (140℉). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff noted that the GALL Report identifies cracking due to SSC as an aging effect applicable for stainless steel, but not for carbon steel components. On the basis that the applicant has no stainless steel or stainless steel clad heat exchanger components exposed to treated water at temperatures greater than 60ºC (>140ºF), and that cracking due to SSC is not an expected aging effect applicable for carbon steel heat exchanger components, the staff finds it acceptable for the applicant to designate LRA Table 3.3.1, item 3.3.1-5, as not applicable.

(3) LRA Section 3.3.2.2.3 addresses cracking due to SCC in diesel engine exhaust piping, piping components, and piping elements. The applicant stated that this aging effect is not applicable because these components are exposed internally to ambient air, and remain dry during normal plant operation.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

In a teleconference dated December 5, 2008, the staff had further discussion with the applicant on why cracking due to SCC was not considered to be an AERM for the stainless steel emergency diesel generator exhaust piping surfaces that are exposed internally to diesel exhaust. The applicant clarified that the aging management review methodology identified that the emergency diesel generators are operating only periodically and that the exhaust environment that results from operations of the generators is not a source of contaminants and is dry.

In AMR item AP-33 in Table II.A of NUREG-1833, “Technical Bases for Revision to the License Renewal Guidance Documents,” the staff provides the following basis on why it is important to identify cracking due to SCC as an AERM for the internal surfaces of stainless steel emergency diesel generator exhaust piping that are exposed to diesel exhaust (i.e. combusted diesel fuel).

> “The Staff has accepted the position that the possible stress corrosion cracking of stainless steel diesel engine exhaust piping, piping components, and piping elements is managed by a plant-specific aging management program. The FCS SER section 3.3.2.4.3 identifies stainless steel as a material in diesel exhaust gas environment with loss of material and cracking as viable aging effects. GALL Rev. 0 Chapter VIIH.2.4-a only identifies carbon steel and loss of material due to general, pitting, and crevice corrosion of steel diesel engine combustion air exhaust subsystem components that are exposed to hot diesel engine exhaust gases containing moisture and particulates. Similar components constructed of stainless steel were observed to be susceptible to cracking in hot diesel exhaust gas. A plant-specific aging management program will be evaluated to provide reasonable assurance that the component’s intended functions will be maintained within the CLB for the period of extended operation.”

The diesel exhaust that results from operations of emergency diesel generators is made up mostly of carbon dioxide (CO2) and water (H2O) in the vapor state. However, there may be some amount of liquid state water (moisture) in the exhaust. Diesel exhaust may also contain some contaminants because the oil fractions that make up the diesel fuel prior to combustion may contain small percentages of nitrogen, sulfur or halogen atomic elements impurities. Thus, the staff noted that its basis in NUREG-1833 differed from the applicant’s basis because NUREG supports that staff’s basis that diesel exhaust could contain enough moisture and particulate containments and that these contaminants lead to cracking in the internal stainless steel emergency diesel generator exhaust piping surfaces that are exposed to the diesel exhaust environment. Thus, based on a comparison of the applicant's position against the relative information in NUREG-1833, the staff took the position that the applicant had not taken a conservative position relative to aging management of cracking due to SCC in the internal surfaces of stainless steel emergency diesel generator exhaust piping that are exposed to diesel exhaust. In a teleconference dated January 5, 2009, the staff discussed the applicant's basis for managing cracking in the stainless steel diesel generator exhaust piping, piping components, and piping elements that are exposed to a diesel exhaust environment. During this teleconference, the applicant stated that it would amend the LRA to identify cracking as an applicable aging effect for the internal stainless steel stainless steel diesel generator exhaust piping, piping component, and piping element surfaces that are exposed to the diesel exhaust environment and that AMP B.2.28, Supplemental Piping and Tanks Inspection Program, will be credited to manage cracking in the internal component surfaces that are exposed to diesel exhaust.

The staff confirmed that the Supplemental Piping and Tanks Inspection Program includes a number of inspection methods, including volumetric (RT or UT) and visual (VT-1 or VT-3 or equivalent) examination techniques that will be performed by qualified personnel on a sample population of subject components. The staff noted that the Subsection IWA-2000 of the ASME Code Section XI lists volumetric and VT-1 visual examination techniques as valid inspection methods for the detection of cracking in metallic components. The staff also noted that GALL AMP XI.M32, "One-Time Inspection," indicates that one-time inspection programs are valid AMPs for cases where: (1) the components may be susceptible to the gradual accumulation or concentration of agents that, if present, could promote certain aging effects, and (2) where additional verification is necessary in order to confirm that degradation is not occurring in the components or is progressing at a very slow propagation rate, or else to trigger additional corrective actions if unacceptable degradation is detected in the components.

The staff verified that, in the applicant's letter of January 12, 2009, the applicant made the appropriate changes to the AMRs for the stainless steel emergency diesel exhaust piping to credit the AMP B.2.28, Supplemental Piping and Tanks Inspection Program, for the management of cracking in the internal stainless steel diesel generator exhaust piping, piping component, and piping element surfaces that are exposed to diesel exhaust. The staff also verified that, in the applicant's letter of January 12, 2009, the applicant amended AMP B.2.28 to add these components to the scope of the AMP. Therefore, based on this assessment, the staff finds that the applicant has provided an acceptable basis for crediting the Supplemental Piping and Tanks Inspection Program for aging management of cracking because: (1) the emergency diesel generators are only periodically operated in accordance with plant technical specifications or transient operating procedures, (2) the applicant's basis is consistent with criteria in GALL AMP XI.M32 on when one-time inspection programs can be credited for aging management, and (3) the applicant's Supplemental Piping and Tanks Inspection Program includes volumetric examination methods and VT-1 or enhanced VT-1 visual inspection methods, which are valid techniques for the detection of cracking in the stainless steel components.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.3.2.2.3 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.4 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

The staff reviewed LRA Section 3.3.2.2.4 against the following criteria in SRP-LR Section 3.3.2.2.4:

(1) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel PWR nonregenerative heat exchanger components exposed to treated borated water greater than 60℃ (140℉) in the chemical and volume control system. The applicant stated that this aging effect is not applicable because SSES is a BWR.

    SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in stainless steel PWR nonregenerative heat exchanger components exposed to treated borated water greater than 60℃ (140℉) in the chemical and volume control system.

    The staff confirmed in SRP-LR Table 3.3-1, Item 7, is only applicable to PWR plants.

    Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.3.2.2.4.1 does not apply to SSES.

(2) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 60℃ (140℉). The applicant stated that this aging effect is not applicable because SSES is a BWR.

    SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 60℃ (140℉).

    The staff confirmed in SRP-LR Table 3.3-1, Item 8, is only applicable to PWR plants.

    Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.3.2.2.4.2 does not apply to SSES.

(3) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. The applicant stated that this aging effect is not applicable because SSES is a BWR.

    SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in the stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. The existing AMP monitors and controls primary water chemistry in PWRs to manage the aging effects of cracking due to SCC. However, control of water chemistry does not preclude cracking due to SCC and cyclic loading; therefore, the effectiveness of water chemistry control programs should be verified to ensure that cracking does not occur.

    The staff confirmed in SRP-LR Table 3.3-1, Item 9, is only applicable to PWR plants.

    Because SSES is a BWR, the staff finds that this item in SRP-LR Section 3.3.2.2.4.3

does not apply to SSES.

Based on the above, the staff concludes SRP-LR Section 3.3.2.2.4 criteria are not applicable.

3.3.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.3.2.2.5 against the following criteria in SRP-LR Section 3.3.2.2.5:

(1) LRA Section 3.3.2.2.5 addresses hardening and loss of strength due to elastomer degradation in components of heating and ventilation systems. The applicant stated that only the elastomers used in flexible connections in the Reactor Building HVAC and the Primary Containment Atmosphere Circulation System were identified as requiring aging management. Levels of ionizing radiation in the Reactor Building and of ionizing radiation and thermal exposure inside Containment exceeded threshold levels for cracking and changes in material properties. Elastomers in HVAC systems in other buildings do not exceed threshold levels for radiation or temperature. The System Walkdown Program is credited for aging management of elastomers in the Reactor Building HVAC and Primary Containment Atmosphere Circulation systems.

SRP-LR Section 3.3.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of heating and ventilation systems exposed to air - indoor uncontrolled (internal/external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

SRP-LR Section 3.3.2.2.5.1 invokes AMR Item 11 in Table 3 of the GALL Report, Volume 1, and AMR Items VII.F1-7, VII.F2-7, VII.F3-7 and VII.F4-6 in the GALL Report, Volume 2, as applicable to elastomeric seals and components in control room, auxiliary and radwaste, primary containment, and diesel generator building heating and ventilation systems that are exposed either internally or externally to uncontrolled indoor air.

The staff reviewed LRA Section 3.3.2.2.5.1 against the staff's recommended regulatory criteria in SRP-LR Section 3.3.2.2.5.1 and the recommendations for these components in GALL AMR Items VII.F1-7, VII.F2-7, VII.F3-7 and VII.F4-6, as applicable to the elastomeric seals and components in the control room, auxiliary and radwaste, primary containment, and diesel generator building HVAC systems that are exposed either internally or externally to uncontrolled indoor air.

The staff noted that the applicant aligned all of its AMR's for the elastomeric auxiliary system seals and components, as given in LRA Tables 3.3.2-7, "Aging Management Review Results – Diesel Generator Buildings HVAC Systems," 3.3.2-9, "Aging Management Review Results – Diesel Generators System," 3.3.2-5, "Aging Management Review Results – Control Structure HVAC Systems," 3.3.2-8, "Aging Management Review Results – Diesel Generator Buildings HVAC Systems," 3.3.2-16, "Aging Management Review Results – Primary Containment Atmosphere Circulation System," "3.3.2-13, "Aging Management Review Results – Fire Protection System," and 3.3.2-23, "Aging Management Review Results – Reactor Building HVAC System," to AMR Item 11 in Table 3 of the GALL Report, Volume 1, but also noted that the applicant was not always consistent in identifying whether hardening or loss of strength were applicable aging effects requiring management (AERMs).

Specifically, the staff noted that, in the applicant's AMRs for elastomeric components in the reactor building HVAC system and the primary containment air processing system that aligned to GALL AMR VII.F3-7, the applicant identified that cracking and changes in material properties were applicable AERMs only for the neoprene rubber or fiberglass flexible connections (expansion joints) in the reactor building HVAC system exposed to external uncontrolled indoor air and for neoprene expansion joints in the primary containment air processing system exposed to internal ventilation and external uncontrolled indoor air. For these components the applicant credited its Systems Walkdown Program to managing cracking and changes in material properties. The staff noted that the applicant did not identify cracking and changes in material properties as applicable AERMs for the internal neoprene rubber and fiberglass expansion joint surfaces in the reactor building HVAC system that are exposed to the ventilation environment and this was not consistent with the applicant's aging management approach taken for the analogous internal neoprene component surfaces in the primary containment air processing system.

The staff also noted that the applicant's ventilation and indoor air environment groupings, as given in LRA Tables 3.0-1 or 3.0-2, cover a range of specific environments and environmental conditions. In the applicant's environmental discussions for these groupings, the staff noted insufficient evidence that the ventilation environment and the uncontrolled indoor air environment are equivalent. The applicant's discussion also did not establish the threshold being used for radiologically-induced aging and the maximum radiological levels the components would be exposed to, or whether the temperatures for the specific environments have the potential to exceed a thermally-induced aging threshold of 95°F.

The staff noted that the applicant had aligned the table 2 AMR item for the following supplemental HVAC or non-HVAC components to AMR Item 11 in Table 3 of the GALL Report, Volume 1 and either to GALL AMR VII.F1-7, VII.F2-7, VII.F3-7, or VII.F4-6:

(1) silicone rubber heat exchanger tube plugs in the diesel generator intake exhaust systems under exposure to the ventilation environment,

(2) elastomeric (synthetic rubber) flexible connections (hoses) in the diesel generator system, high pressure coolant injection system, and fire protection system under external exposure to uncontrolled indoor air,

(3) neoprene flexible connections in the diesel generator buildings HVAC system that are exposed internally to the ventilation environment and externally to the uncontrolled indoor air environment,

(4) neoprene/asbestos flexible connections in the diesel generator buildings HVAC system and the control structure HVAC system that are exposed internally to the ventilation environment and externally to the uncontrolled indoor air environment, and

(5) neoprene/fiberglass flexible connections in the diesel generator buildings HVAC system and the control structure HVAC system that is exposed internally to the ventilation environment and externally to the uncontrolled indoor air environment.

However, in these AMRs, the staff noted that the applicant did not identify any AERMs for the elastomeric/polymeric component surfaces that are exposed either to a ventilation air environment or an uncontrolled indoor air environment, and that in LRA Section 3.3.2.2.5.1, the applicant only justified this by stating the temperatures and radiation levels for the elastomers/polymeric materials in these systems “do not exceed threshold levels for radiation or temperature.”

Thus, the staff had the following issues with the applicant’s AMRs for the elastomeric and polymeric auxiliary system components that the applicant had aligned to AMR Item 11 in Table 3 of the GALL Report, Volume 1 and either to GALL AMR VII.F1-7, VII.F2-7, VII.F3-7, or VII.F4-6:

- The applicant did not provide sufficient evidence that the environmental conditions between the ventilation environments were equivalent to an uncontrolled, indoor air environment. Thus, for those elastomeric or polymeric components that the applicant had identified as being subject to the aging effects of “cracking” or “changes in material properties,” the applicant did not provide sufficient basis why the external visual examinations performed under the Systems Walkdown Program could be used as the basis for managing cracks/subsurface cracks that only break the internal surface or change in material property exposed to the ventilation environment.

- For those elastomeric or polymeric components that the applicant had identified as being subject to the aging effect of “changes in material properties,” the applicant did not define the specific material properties that could be impacted by exposure to either the ventilation environment or the uncontrolled indoor air environment.

- The applicant did not provide a sufficient basis for concluding that there are not any applicable AERMs for the surfaces of the neoprene and fiberglass flexible connections in the reactor building HVAC that are exposed to internal ventilation when cracking and changes in material properties were identified as applicable AERMs for the neoprene expansion joints in the primary containment air processing system exposed to internal ventilation. Also the applicant did not provide the levels of ionizing radiation in the Reactor Building and of ionizing radiation and thermal exposure inside Containment that may have exceeded threshold levels for cracking and changes in material properties.

- For those supplemental HVAC or non-HVAC elastomeric or polymeric components that the applicant had aligned to the GALL item, but had not identified any applicable AERMs under exposure to an indoor air or ventilation environment, the applicant did not establish an acceptable basis for concluding that there are not any AERMS for the components. Specifically, the applicant did not establish how high the temperatures and radiation levels could reach under the specific environmental conditions for the subsystems exposed to these environments. Nor did the applicant identify the radiation level threshold for concluding that radiation-induced cracking or material property changes could occur in the polymetric/elastomeric materials used to fabricate these auxiliary system components.

In RAI 3.3.2.2.5.1-1, Part A, by letter dated July 23, 2008, the staff asked the applicant to specify the polymetric/elastomeric material properties that are within the scope of the applicant's aging effect "change in material properties." In RAI 3.3.2.2.5.1-1, Part B, by the same letter, the staff asked the applicant to justify, using a valid technical basis, why cracking and changes in material properties was not identified as an applicable aging effect requiring management (AERM) for the neoprene or fiberglass flexible connection (expansion joint) surfaces in the reactor building HVAC system that are exposed internally to the ventilation environment when these aging effects had been identified as AERMs for the neoprene expansion joint surfaces in the primary containment air processing system that are exposed internally to the ventilation system.

In its letter dated August 27, 2008, in response to RAI 3.3.2.2.5.1-1 Part A, the applicant stated that the specific material properties that could be impacted by exposure to either the ventilation or uncontrolled indoor air environment are hardening (e.g., embrittlement, decrease in elasticity) and loss of strength (e.g., elongation, loss of tensile strength, and, with exposure to ionizing radiation, swelling or melting). The applicant also stated that both types of material property changes could occur as a result of prolonged exposure to high temperature (95^{o}F or higher), high radiation levels (equal to or greater than 10E6 rads total integrated dose (TID)), or to ultraviolet radiation or ozone.

In response to RAI 3.3.2.2.5.1-1 Part B, the applicant provided rationale for not identifying aging effects requiring management for neoprene or fiberglass flexible connections in the Reactor Building HVAC system. The applicant provided a summary of the stressors in the Reactor Building where these flexible connections are located. The applicant further stated that:

- There are no sources of ionizing radiation within the ventilation environment of the Reactor Building HVAC system that could cause the radiation levels to exceed the threshold level of 10E6 rads TID,

- There are no additional heat sources within the ventilation environment of the Reactor Building HVAC system that could contribute to prolonged thermal exposure to a temperature of 95^{o}F or higher,

- The ventilation environment of the Reactor Building HVAC system contains no sources of ultraviolet radiation or ozone.

Therefore, the applicant concluded that for neoprene components in the Reactor Building HVAC system there are no aging effects requiring management.

The staff reviewed the applicant response to RAI 3.3.2.2.5-1, Parts A and B and finds the applicant response acceptable because (1) the applicant adequately defined the specific material properties that could be affected by exposure to ventilation atmosphere, and (2) the applicant identified the location where these flexible connections are located in the Reactor Building and defined the stressors that could cause the aging effects in neoprene flexible connections at those locations. The applicant response is consistent with the GALL Report definitions of neoprene material in Section IX and the threshold limits of the stressors as recommended in the GALL Report Section IX. On the basis of its review, the staff finds that neoprene flexible hoses in the Reactor Building HVAC system will not experience the aging effects of cracking and change in material properties in a ventilation environment.

In RAI 3.3.2.2.5.1-2, Part A, by letter dated July 23, 2008, the staff asked to applicant to clarify, using a valid technical basis, why the environmental conditions for an internal ventilation environment is considered to be equivalent to the environmental conditions that are applicable to an external uncontrolled indoor air environment. In RAI 3.3.2.2.5.1-2, Part B the staff asked the applicant, for each environment that is within the scope the "ventilation" environmental grouping or "indoor air/protected from weather" environmental grouping in the LRA, to identify and justify the basis the radiological-induced (gamma ray) aging threshold and threshold that is used to screen polymer/elastomer components in these environments for age related degradation (including cracking, hardening, loss of strength, or other material property changes), and to identify what the maximum-to-minimum temperature ranges and maximum gamma radiation levels are for these specific environments.

In its letter dated August 27, 2008, in response to RAI 3.3.2.2.5.1-2, the applicant stated the following for Part A:

> As described in LRA Table 3.0-1, internal ambient environments found inside components, such as piping and tanks that are either vented or otherwise open to the ambient conditions in their location, are also included in the "ventilation" environment grouping. It is reasonable to assume that, for such components, the relevant conditions that can lead to aging, such as temperature and moisture, are the same both inside and outside the component. In these cases, the condition of the external surface is expected to be representative of the internal surface condition.
>
> Also included in the "ventilation" environment grouping is ambient air that may be conditioned by filtering, heating, cooling, or dehumidification, or some combination thereof, in order to maintain a suitable environment for equipment operation or personnel occupancy. For components exposed internally to this environment, it is reasonable to assume that the relevant conditions that can lead to aging are generally less aggressive, or at least no more aggressive, than the ambient air to which the same components are exposed externally. In these cases, aging of the external surfaces is expected to progress at a faster rate than aging of the internal surfaces.
>
> In both of these cases, the System Walkdown Program, which is consistent with the GALL AMP XI.M36 External Surfaces Monitoring, may be credited with aging management.

In response to Part B, the applicant stated that ionizing radiation, temperatures, and exposure to ultraviolet radiation and ozone were all within the threshold limits as recommended in the GALL Report. The applicant provided a table identifying the minimum and maximum normal operating temperature and the maximum total integrated dose for specific buildings/ areas within the plant and within the scope of license renewal. The applicant stated that the maximum temperature in each building represents a hot spot or a design consideration for HVAC, and the temperature is not expected to equal or exceed 95^{o}F for a prolonged period of time.

The staff reviewed the applicant response for RAI 3.3.2.2.5.1-2, Part A and finds that the applicant has provided an adequate technical basis to conclude that the internal ventilation environments are considered equivalent to or less aggressive than the external uncontrolled indoor-air environment. Therefore, the staff finds that the System Walkdown Program, which manages the aging effects of the external surfaces of the piping can also be credited for the internal surfaces on the basis that these two environments are similar. The staff reviewed the applicant response for RAI 3.3.2.2.5.1-2, Part B and finds that the applicant has appropriately identified the temperatures and total integrated dose levels in the various structures that are within the scope of license renewal. The applicant response is consistent with the GALL Report definition of the threshold limits of the stressors as recommended in the GALL Report Section IX. On this basis, the staff finds the applicant response adequate.

In RAI B.2.32-4, the staff asked the applicant to justify its basis for crediting the System Walkdown Program to manage cracking and changes in material properties that may occur in the internal surfaces of in-scope components that are fabricated from either an elastomeric or polymeric material. The staff also asked the applicant to clarify how visual examinations alone from the external surfaces of these materials would be capable of detecting the following aging effects: (1) a tightly configured crack that penetrates the external surface of the component, (2) a subsurface crack or a crack that only penetrates the internal surface of the materials, and (3) a change in a material property, such as a potential change in the hardness property or strength property for the elastomer or polymer material used to fabricate the component. RAI B.2.32-4 is relevant to the acceptance of the applicant’s AMR basis for neoprene and fiberglass flexible connection (expansion joint) surfaces in the reactor building HVAC system and primary containment air processing system that are exposed internally to the ventilation environment or externally to the uncontrolled indoor air environment. The staff’s acceptance of the System Walkdown Program to manage the aging effects of cracking and change of material properties for elastomers and the discussion of RAI B.2.32-4 are documented in SER Section 3.0.3.2.14. Based on this review, the staff concludes that the System Walkdown Program will adequately manage the aging effects of cracking and change in material properties of neoprene flexible hoses during the period of extended operation.

In RAI 3.3.2.2.5.1-3, Part A, and RAI 3.3.2.3-1 by letter dated July 23, 2008, the staff asked the applicant to provide its basis why there are not any applicable AERMs identified for the following component/material/environmental combinations:

(1) silicone rubber heat exchanger tube plugs in the diesel generator intake exhaust systems under exposure to the ventilation environment,

(2) elastomeric (synthetic rubber) flexible connections (hoses) in the diesel generator system and fire protection system under external exposure to uncontrolled indoor air,

(3) neoprene flexible connections in the diesel generator buildings HVAC system that are exposed internally to the ventilation environment and externally to the uncontrolled indoor air environment,

(4) neoprene/asbestos flexible connections in the diesel generator buildings HVAC system and the control structure HVAC system that are exposed internally to the ventilation environment and externally to the uncontrolled indoor air environment, and

(5) neoprene/fiberglass flexible connections in the diesel generator buildings HVAC system and the control structure HVAC system that is exposed internally to the ventilation environment and externally to the uncontrolled indoor air environment.

In RAI 3.3.2.2.5.1-2, Part B, the staff asked the applicant to identify what its thermally-induced and radiologically-induced thresholds are for concluding that thermally-induced and radiologically-induced cracking and changes in material properties could occur for the component/material/environmental combinations discussed in Part A of the questions and what the maximum temperature and radiation levels will be for the specific ventilation and/or indoor air environments that the system components are exposed to.

In its letter dated August 27, 2008, in response to RAI 3.3.2.2.5.1-3, Parts A and B, and RAI 3.3.2.3-1, the applicant provided a listing of the structures in which the above identified component/material/environment combinations is located. In all those locations, the applicant indicated that threshold limits for ionizing radiation, temperature, ultraviolet radiation and ozone levels will not be exceeded.

On the basis that the recommended threshold levels of the GALL Report will not be exceeded, the staff concludes that the identified component/material/environment combinations will not have any aging effects requiring management.

(2) LRA Section 3.3.2.2.5 addresses hardening and loss of strength due to elastomer degradation in spent fuel cooling and cleanup systems. The applicant stated that this aging effect is not applicable because elastomer linings do not perform an intended function.

SRP-LR Section 3.3.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer linings of the filters, valves, and ion exchangers in spent fuel pool cooling and cleanup systems (BWR and PWR) exposed to treated water or treated borated water. The GALL Report recommends that a plant-specific AMP be evaluated to determine and assess the qualified life of the linings in the environment to ensure that these aging effects are adequately managed.

For BWR designs, SRP-LR Section 3.3.2.2.5.2 invokes AMR Item 12 in Table 3 of the GALL Report, Volume 1, and AMR Item VII.A4-1 in the GALL Report, Volume 2, as applicable to elastomeric liners in BWR spent fuel cooling and cleanup systems that are exposed internally to the treated water environment of the spent fuel pool coolant

The staff verified that the applicant does not credit any elastomeric liners in the SSES fuel pool, fuel pool and cleanup system, or fuel pool auxiliaries for aging management. However, the staff noted that the applicant did align one other auxiliary system AMR for elastomeric components to the staff’s AMR recommendations in AMR Item 12 in Table 3 of the GALL Report, Volume 1, and GALL AMR Item VII.A4-1. In this AMR, the applicant identified that the silicone rubber heat exchanger tube plugs in diesel generator intake and exhaust systems are exposed internally to a treated water environment and are within the scope of an AMR. In this AMR, the applicant stated that there are not any applicable aging effects requiring management (AERMs) for the internal tube plug surfaces that are exposed to a treated water environment. The staff noted that the applicant did not provide any basis for concluding that there are not any applicable AERMs for the tube plug surfaces that are exposed the treated water environment. The staff noted that, in contrast to the applicant's determination, GALL AMR VII.A4-1 identifies that elastomeric materials may degrade (i.e., harden or lose strength) under exposure to treated water.

In RAI 3.3.2.2.5.2-1, by letter dated July 23, 2008, the staff asked the applicant to justify its basis for concluding that the silicone tube plugs in the diesel generator intake/exhaust system heat exchangers would not degrade (i.e., harden or lose strength) for the tube plug surfaces that are exposed to the treated water environment.

In its letter dated August 27, 2008, in response to RAI 3.3.2.2.5.2-1, the applicant stated that change in material properties and cracking of elastomers, such as silicone, may be due to ionizing radiation, thermal exposure, or exposure to ultrasonic radiation or ozone.

The applicant further stated that:

- The silicone tube plugs are located in the Diesel Generator Buildings, where the total integrated dose is well below 10E6rads. Also, during normal plant operation, the silicone tube plugs are exposed to a treated water environment that is not expected to contain or to release any measurable ionizing radiation.

- To ensure proper diesel generator operation, Diesel Generator Rooms A, B, C and D are individually ventilated and heated to maintain a temperature in the range of approximately 85°F to 95°F. Also, during normal plant operation, the diesel generators are in a standby mode, so the silicone tube plugs are exposed to a treated water temperature that is expected to be approximately the same as the ambient air temperature.

- The tube plugs are fabricated of silicone rather than natural rubber, and silicone has been demonstrated to have excellent resistance to ultraviolet radiation and ozone. The treated water environment associated with the Diesel Generator intake/exhaust system contains no sources of ultraviolet radiation or ozone.

Therefore, the applicant stated that change in material properties and cracking is not an aging effect requiring management because none of these stressors exceed their threshold limits.

The staff reviewed the applicant response to RAI 3.3.2.2.5.2-1, and finds the applicant response acceptable because (the applicant identified the location where these silicone tube plugs are located in the Diesel Generator Building and defined the stressors that could cause the aging effects at those locations. Although these silicone plugs are in a treated water environment, the staff noted that the stressors that could cause aging degradation in the diesel generator system and in the diesel generator building are not the same as in the spent fuel pool and cleanup system where a higher radiation level and temperatures could be experienced. The staff finds that the applicant's response provides an acceptable basis for concluding that cracking and changes in material properties are not applicable aging effects for these components because: (1) the environmental conditions are at temperatures less than or equal to 95°F and do not include sources of radiation or ozone, (2) this is consistent with the GALL Table IX.C that cracking and changes in material properties are only applicable aging effect if the component operating termperatures are greater than 95°F, or if they are exposed to radiation or ozone.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.5 criteria. For those line items that apply to LRA Section 3.3.2.2.5, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

The staff reviewed LRA Section 3.3.2.2.6 against the criteria in SRP-LR Section 3.3.2.2.6.

LRA Section 3.3.2.2.6 addresses reduction of neutron-absorbing capacity and loss of material due to general corrosion. The applicant stated that these aging effects are not applicable because Boral, the neutron-absorbing medium, does not degrade as a result of long-term exposure to radiation, and Boral is stable, durable, and corrosion resistant.

SRP-LR Section 3.3.2.2.6 states that reduction of neutron-absorbing capacity and loss of material due to general corrosion may occur in the neutron-absorbing sheets of BWR and PWR spent fuel storage racks exposed to treated water or treated borated water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

During its review the staff noted the referenced GALL Report Item VII.A2-3 lists the aging effects as reduction of neutron absorbing capacity and loss of material due general corrosion. However the AMR result line item in LRA Table 3.5.2-2 used a footnote E for the MEAP combination of boral, treated water, loss of material and BWR Water Chemistry Program. Also during its review, the staff found industry operating experience of aluminum cations being found in the spent fuel pool water that could potentially be from the aluminum poison cans or from the Boral material made from aluminum-boron carbide composite. By letter dated June 13, 2008 the staff sent RAI 3.3.2.2.6-1 to ask the applicant whether plant-specific operating experience exists at SSES in which aluminum cations were found in the spent fuel pool water and to explain the source of the aluminum. The staff further asked the applicant to justify the basis for not crediting a one-time inspection to determine the effectiveness of the BWR Water Chemistry Program in managing these aging effects.

By letter dated July 24, 2008, the applicant stated in its response letter that SSES does not have plant-specific operating experience with respect to the presence of aluminum cations in the spent fuel pool. The staff noted that the industry operating experience related to the galvanic corrosion between the stainless steel enclosure and the aluminum clad is applicable to PWR's because of the presence of boric acid in the spent fuel pool water which supports this type of corrosion. SSES is a BWR plant that does not contain boric acid in the spent fuel pool and utilizes Boral plates which are contained in sealed tubes manufactured under an accepted Quality Assurance Program, which would prevent the spent fuel pool water from making contact with the Boral material. The applicant also provided plant-specific results from the Boral sample coupons, in which half of the coupons were non-vented to simulate the expected conditions of the spent fuel pool in which water was not in contact with the Boral and the other half of the coupons were vented in simulate the conditions if the Boral was in contact with the spent fuel pool water. The applicant stated the results of the Boral coupons that were non-vented have not shown signs of blistering, pitting corrosion or loss of neutron-absorbing capacity and the results of the vented Boral coupons have shown some blistering on the edges but neutron attenuation testing has shown the Boral has retained its design properties for neutron attenuation. On the basis of its review, the staff finds the applicant's response acceptable because the applicant has not found aluminum cations in the spent fuel pool water and the applicant has test results from Boral sample coupons that are representative of the poison cans in the spent fuel pool which have shown that there has not been a loss of neutron absorbing capacity.

The staff noted that the applicant's proposed AMP for managing loss of material due to pitting and crevice corrosion is the BWR Water Chemistry Program, alone, without a confirmatory inspection program. Because the applicant had not provided sufficient justification to explain how the BWR Water Chemistry Program, alone, will provide adequate management for the potential aging effect of loss of material due to pitting or crevice corrosion, the staff issued RAI 3.3-1 by letter July 15, 2008. The RAI asks the applicant to justify why an inspection program, such as the Chemistry Program Effectiveness Inspection is not needed to confirm that age related degradation of the components is not occurring.

In a letter dated August 15, 2008, the applicant responded to RAI 3.3-1 by providing a response to the RAI, citing both industry and plant-specific data. Excerpts from that response are repeated below:

> The technical justification of the Boral neutron-absorbing capability aging assessment is based on plant-specific and industry operating experience. Loss of material of aluminum in treated water due to general corrosion is not an aging effect requiring management consistent with the GALL (e.g., VII.A4-5), but loss of material due to crevice and pitting corrosion is an aging effect requiring management and is managed by the BWR Water Chemistry Program…
>
> <u>Industry Experience:</u>
>
> Potential aging effects resulting from sustained irradiation of Boral have been previously evaluated by the staff in NUREG-1787, Safety Evaluation Report Related to the License Renewal of the Virgil C. Summer Nuclear Station (VCSNS). NUREG-1787 states, "… the applicant asserts that Boral does not degrade as a result of long-term exposure to radiation, and there are no aging effects applicable to Boral neutron-absorbing sheets in the spent fuel storage racks of VCSNS. The potential aging effects resulting from sustained irradiation of Boral were previously evaluated by the staff (BNLNUREG-25582, dated January 1979) and determined to be insignificant. Therefore the staff finds the applicant's AMR conclusions to be acceptable."
>
> A search of industry experience (INPO EPIX database) revealed the same conclusion that no instances of reduction of Boral neutron-absorbing capability have been experienced by other nuclear plants.
>
> <u>SSES Plant-Specific Operating Experience:</u>
>
> Half of the SSES Boral sample coupons are non-vented, simulating the expected condition at the racks. These have not shown any blistering, pitting corrosion or loss of neutron-absorbing capability. The other half of the SSES Boral coupons are vented,

simulating a portion of the fuel rack having a bad weld, allowing water into the area with the Boral plates. These vented samples have shown blistering near the edges of the plate due to the porous nature of the cut edge of the plate, where water interacts with the Boron matrix and radiation to generate gases that blister the plate. This effect has, in some cases, caused the outer metal layer of the Boral plate (sample) to blister out and press flat against the outer tube that contains it. This contact in a demineralized water environment has shown no signs of galvanic or other corrosion. Neutron attenuation testing has shown that these plates still retain the required design properties for neutron attenuation. Weighing of the samples has shown no loss of material, although some minor gains in weight (post drying) may be related to the water intrusion/interaction with decay products.

The most recent Boral coupon tests (year 20 coupon test) for Units 1 and 2 were performed by independent testing facilities in 2003 and 2005, respectively. The range of water chemistry conditions to which the Boral coupons were subjected are within the fuel pool chemistry specification limits as delineated in the Susquehanna Chemistry Manual.

Boral sample coupons are removed from the fuel pool periodically for testing and are evaluated for corrosion or other degradation of the neutron absorber by comparing various physical characteristics. Additional Boral coupons are scheduled to be removed from the spent fuel storage pool and analyzed at years 30 and 40 under a current licensing commitment per UFSAR Section 9.1.2.3.3. The scheduled Boral sample coupon testing is a verification of effectiveness of the credited BWR Water Chemistry program.

Based on SSES plant-specific experience of Boral coupon inspections and testing, the loss of material aging effect has been and will continue to be adequately managed by the BWR Water Chemistry Program.

The staff reviewed the applicant's response, including the current licensing commitment for inservice inspection of plant-specific Boral coupons, as described in the applicant's UFSAR. The staff notes that both industry and current plant-specific operating experience show that aging effects do not occur or progress very slowly for Boral neutron-absorbing sheets exposed to treated water in a spent fuel pool; and, in addition, the applicant's current licensing commitment for continued Boral coupon testing at 30 and 40 years provides on-going confirmation of effectiveness of the applicant's BWR Water Chemistry Program in controlling the potential aging effects of loss of material due to pitting or crevice corrosion in Boral neutron absorbing sheets exposed to treated water in the spent fuel pool.

The staff reviewed the BWR Water Chemistry Program which will control the quality of the spent fuel pool water to prevent the loss of material of the aluminum cladding and boron-carbide materials within. The staff evaluated the BWR Water Chemistry Program, and the evaluation is documented in SER Section 3.0.3.1.1. On the basis that the applicant has demonstrated with both industry and plant-specific experience that aging effects do not occur or progress very slowly in a treated water environment and the applicant's current licensing commitment for continued Boral coupon testing provides confirmation of the effectiveness of the BWR Water Chemistry Program, the staff finds crediting of the BWR Water Chemistry Program, alone, for managing the aging effects of Boral neutron-absorbing sheets exposed to treated water in the spent fuel pool to be acceptable.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.3.2.2.6 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.7 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.3.2.2.7 against the following criteria in SRP-LR Section 3.3.2.2.7:

(1) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion in the reactor coolant pump oil collection system. The applicant stated that this aging effect is not applicable because the SSES primary containment is inerted during normal operation, which meets the requirements of item III.O in 10 CFR Part 50 Appendix R.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements, including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil (as part of the fire protection system). The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation. In addition, corrosion may occur at locations in the reactor coolant pump oil collection tank where water from wash-downs may accumulate; therefore, the effectiveness of the program should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, including determination of the thickness of the lower portion of the tank. A one-time inspection is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff verified that only piping, piping components and elements that align to GALL AMR VII.F1-19 and VII.H2-20 for the Fire Protection, Reactor Building Chilled Water, Control Structure Chilled Water and Diesel Generator Lubricating Oil and NSAS Component Systems that are fabricated from steel materials are applicable to SSES.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13 respectively. The staff reviewed the applicant's Lubricating 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 elements exposed to lubricating oil internally or externally. The staff verified that the applicant has credited its Lubricating Oil Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program to manage this aging effect. The applicant's AMPS are consistent with those recommended for aging management in SRP-LR Section 3.3.2.2.7, Item #1 and in GALL AMR Items VII.F1-19 and VII.H2-20.

Based on the program identified above, the staff concludes that the applicant's program meet SRP-LR 3.3.2.2.7 Item #1 criteria and therefore the applicant's AMRs are consistent with those under GALL Report Item VII.F1-19 and VII.H2-20. For those line items that apply to LRA Section 3.3.2.2.7 Item #1, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

LRA Section 3.3.2.2.7, item #1 states that item numbers 3.3.1-15 and 3.3.1-16 of LRA Table 3.3.1 are not applicable to SSES, which align to the GALL Report Items VII.G-26 and VII.G-27. The staff noted that SSES is of BWR design and contains a primary containment that is inerted during normal operation, thus SSES meets the requirements of 10 CFR Part 50 Appendix R Section III.O, and is not required to have an oil collection system for the reactor coolant pump by the rule. The staff confirmed that since SSES is a BWR with an inert primary containment atmosphere, it has no reactor coolant pump oil collection system. Therefore, aging of the piping, tubing, valves bodies, and tanks in the reactor coolant pump oil collection system are not applicable for SSES. Thus, the staff finds the applicant's conclusion that the aging effect loss of material due to general, pitting and crevice corrosion is not applicable to SSES, acceptable because SSES does not have a reactor coolant pump oil collection system and GALL Items VII.G-26 and VII.G-27 do not apply.

(2) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion in the BWR reactor water cleanup and shutdown cooling systems. The applicant stated that loss of material due to general, pitting, and crevice corrosion for steel piping components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements in the BWR reactor water cleanup and shutdown cooling systems exposed to treated water. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from general, pitting, and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause general, pitting, or crevice corrosion; therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that in addition to applying this AMR result for reactor water cleanup system components, the applicant also applied this AMR result for carbon steel piping and valve bodies exposed to treated water in the fuel pool cooling and cleanup system and fuel pools and auxiliaries (LRA Table 3.3.2-14, pages 3.3-253 and 3.3-357), for carbon steel piping components exposed to treated water in the process and area radiation monitoring system (LRA Table 3.3.2-17, page 3.3-269), for carbon steel accumulators, piping, valve bodies, and piping and piping components exposed to treated water in the control rod drive hydraulics system (LRA Table 3.3.2-3, pages 3.3-102, 3.3-105, 3.3-107, and 3.3-108), and for carbon steel accumulators exposed to treated water in the standby liquid control system (LRA Table 3.3.2 31, page 3.3-339). For all of these AMR result lines, the applicant proposed to manage the aging effect of loss of material for carbon steel components in a treated water environment with a combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to general, pitting, and crevice corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to general, pitting and crevice corrosion, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection of the aging effect if it should occur, the staff finds the applicant's proposed AMPs for managing the aging effect of loss of material due to general, pitting, and crevice corrosion for carbon steel components exposed to treated water in the reactor water cleanup system, the fuel pool cooling and cleanup system and fuel pools and auxiliaries, the process and area radiation monitoring system, the control rod drive hydraulics system, and the standby liquid control system to be acceptable.

(3) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion in diesel exhaust piping, piping components, and piping elements. The applicant stated that loss of material due to general corrosion for steel piping components exposed to diesel exhaust is managed by the System Walkdown Program. Loss of material due to corrosion was not identified as an applicable aging effect for the stainless steel diesel exhaust piping flexible connections and tubing which are located inside the diesel generator buildings. The diesel exhaust system is normally in standby mode and the inside surfaces of the components are dry and not subject to any type of wetting.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general (steel only), pitting, and crevice corrosion may occur in steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

SRP-LR Section 3.3.2.2.7.3 references AMR item 18 in Table 3 of the GALL Report, Volume 1 and AMR item VII.H2-2 in Table VII.H2 of the GALL Report, Volume 2 as the applicable AMRs for evaluating loss of material due to general, pitting, and crevice corrosion in steel and stainless steel diesel generator piping, piping components, and piping elements that are exposed to a diesel exhaust environment. The aging management guidance in these AMRs for diesel generator exhaust piping is consistent with that given SRP-LR Section 3.3.2.2.7.3.

The staff noted that the applicant's AMR items on loss of material in emergency diesel generator exhaust piping components are given in AMR item 3.1.1-18 of LRA Table 3.3.1 and in the AMR items in LRA Table 3.3.2-9, "Aging Management Review Results – Diesel Generators System," that are have reference links LRA AMR item 3.1.1-18 The staff confirmed that LRA Table 3.3.2-9 did include AMRs for the managing loss of material due to general, pitting, and crevice corrosion in internal steel emergency diesel generator piping, piping components, and piping elements surfaces that are exposed to a ventilation environment and that these AMRs were referenced to GALL AMR VII.H2-2. The staff also confirmed that in these AMRs, the applicant credited AMP B.2.32, Systems Walkdown Program, to manage loss of material in the internal steel diesel generator exhaust piping, piping components, and piping element surfaces that are exposed to a ventilation (in this case diesel exhaust) environment.

The staff noted that its Systems Walkdown Program, the applicant identifies that the AMP is consistent the staff's recommended program elements in GALL AMP XI.M36, "External Surfaces Monitoring Program," which is a program that is credited only for managing loss of material that occurs in external metal component surfaces, or for aging management of their external paint or coating surfaces in the components are painted or coating with plastic coatings. The staff also noted that the "scope of program" program element in GALL AMP XI.M36 states the a program corresponding to the GALL AMP XI.M36 may only be used to internal component surfaces if the "material and environment combinations are the same for internal and external surfaces such that external surface condition is representative of internal surface condition."

The staff noted that, in LRA Table 3.0-1 of the application, the applicant equates the emergency diesel generator exhaust environment to be the equivalent of the applicant's "ventilation environment" for the application, which is defined by the applicant as follows:

> Ventilation air and compressed air and gases. Ventilation air is defined as ambient air that is conditioned to maintain a suitable environment for equipment operation or personnel occupancy. Ventilation air may be conditioned by filtering, heating, cooling, dehumidification or some combination.
>
> Internal ambient environments found inside components such as piping and tanks that are either vented or otherwise open to the ambient conditions in their location are also included under this environment, as are exhaust gases, such as from a diesel engine.
>
> While ventilation is predominantly an internal environment, the external surfaces of mechanical components may be exposed to ventilation (e.g., cooling unit tubes in HVAC systems).
>
> Comparable GALL environments: Air – Indoor Uncontrolled, Air – Outdoor,

Condensation, Diesel Exhaust

The diesel exhaust that results from operations of emergency diesel generators is made up mostly of carbon dioxide (CO2) and water (H2O) in the vapor state. However, there may be some amount of liquid state water (moisture) in the exhaust. Diesel exhaust may also contain some contaminants because the oil fractions that make up the diesel fuel prior to its combustion may contain small percentages of nitrogen, sulfur or halogen atomic elements impurities. These type of environmental conditions are reflected in the staff's environmental description in GALL Table IX.D for diesel exhaust, which states that diesel exhaust contains "gases, fluids, and particulates." The staff took issue with equating the diesel exhaust environment to the indoor ventilation environment that would be on the outside of these piping, piping components, and piping elements because the diesel exhaust could contain significant levels of moisture and contaminants that are not normally present in the indoor ventilation air. Thus, the staff was of the opinion that the applicant was not justified in crediting the System Walkdown Program for managing loss of material the internal emergency diesel generator piping, piping component, and piping element surfaces that are exposed to diesel exhaust because the diesel exhaust could contain create more harsh conditions than would the normal ventilated air inside of the diesel generators rooms.

In a teleconference dated January 5, 2009, the staff discussed the applicant's basis for managing loss of material in the steel stainless steel diesel generator exhaust piping, piping components, and piping elements that are exposed to a diesel exhaust environment. During this teleconference, the applicant stated that it will amend the LRA to identify loss of material as an applicable aging effect for the internal steel and stainless steel diesel generator exhaust piping, piping component, and piping element surfaces that are exposed to the diesel exhaust environment and to credit a one-time examination of the internal components surfaces using the examinations techniques of the AMP B.2.28, Supplemental Piping and Tanks Inspection Program for aging management of this aging effect.

The staff confirmed that the applicant's Supplemental Piping and Tanks Inspection Program is a one-time inspection program for miscellaneous plant piping and tank components and that the AMP credits a combination of established volumetric (RT or UT) and visual (VT-1 or VT-3 or equivalent) examination techniques performed by qualified personnel on a sample population of subject components. The staff noted that the Subsection IWA-2000 of the ASME Code Section XI lists volumetric and VT-1 visual examination techniques as valid inspection methods for the detection of cracking in metallic components. The staff also noted that GALL AMP XI.M32, "One-Time Inspection," indicates that one-time inspection programs are valid AMPs for cases where: (1) the components may be susceptible to the gradual accumulation or concentration of agents that, if present, could promote certain aging effects, and (2) where additional verification is necessary in order to confirm that degradation is not occurring in the components or is progressing at a very slow propagation rate, or else to trigger additional corrective actions if unacceptable degradation is detected in the components.

The staff verified that, in the applicant's letter of January 12, 2008, the applicant made the appropriate changes to the AMRs for the steel stainless steel emergency diesel exhaust piping, piping components, and piping elements to credit the AMP B.2.28, Supplemental Piping and Tanks Inspection Program, to manage loss of material in the internal steel and stainless steel diesel generator exhaust piping, piping component, and piping element surfaces that are exposed to diesel exhaust. The staff also verified that, in the applicant's letter of January 12, 2008, the applicant made amended AMP B.2.28 to add the diesel exhaust piping to the scope of the AMP. Therefore, based on this assessment, the staff finds that the applicant has provided an acceptable basis for crediting the Supplemental Piping and Tanks Inspection Program for aging management of loss of material in these components because: (1) the emergency diesel generators are only periodically operated in accordance with plant technical specifications or transient operating procedures, (2) the applicant's basis is consistent with criteria in GALL AMP XI.M32 on when one-time inspection programs can be credited for aging management, and (3) the applicant's Supplemental Piping and Tanks Inspection Program includes volumetric examination methods and VT-1 or VT-3 visual inspection methods, which are valid techniques for the detection of loss of material in these steel and stainless steel diesel exhaust components.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.7 criteria. For those line items that apply to LRA Section 3.3.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.8 against the criteria in SRP-LR Section 3.3.2.2.8.

LRA Section 3.3.2.2.8 addresses loss of material due to general, pitting, crevice, and microbiologically influence corrosion (MIC). The applicant stated that loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components with coatings buried in soil is managed by the Buried Piping and Tanks Inspection Program. Loss of material for buried steel piping components with damaged coatings and buried in soil is managed by the Buried Piping Surveillance Program.

SRP-LR Section 3.3.2.2.8 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. Buried piping and tanks inspection programs rely on industry practice, frequency of pipe excavation, and OE 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 OE with buried components, ensuring that loss of material does not occur.

The Buried Piping and Tanks Inspection Program is discussed in SER Section 3.0,3.2.13. The Buried Piping and Tanks Inspection Program relies on examination of buried steel piping and piping components with coatings during routine maintenance or by using focused inspections at least once in the ten years prior to entering the period of extended operation and at least once during the first ten years of entering the period of extended operation. The Buried Piping Surveillance Program is discussed in SER Section 3.0.3.2.10. The Buried Piping Surveillance Program relies on the use of cathodic protection to protect buried steel piping with damaged coatings. Reference electrodes are placed along the buried piping which are used to measure the potential of the buried piping to ensure that it is adequately protected by the cathodic protection system. In addition, coating conduction measurements are taken to indicate that the cathodic protection is adequately installed, and current requirements are trended to insure that further damage to the coatings is not occurring. Finally, pipe to soil potential surveys are preformed on an annual basis to further demonstrate adequate protection of the buried steel piping with damaged coatings.

Based on the programs identified, the staff concludes that the applicant's AMR results are acceptable because the AMPs provide both detection and mitigation for the aging effect of loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components with coatings buried in soil in the subject components. For those items that apply to LRA Table 3.3.1, item 3.3.1 19 and Table 3.4.1, item 3.4.1-17, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.8 criteria. For those line items that apply to LRA Section 3.3.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.9 Loss of Material Due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

The staff reviewed LRA Section 3.3.2.2.9 against the following criteria in SRP-LR Section 3.3.2.2.9:

(1) LRA Section 3.3.2.2.9 addresses loss of material due to general, pitting, crevice, MIC and fouling in piping, piping components, and piping elements exposed to fuel oil. The applicant stated that loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components and tanks exposed to fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components and tanks exposed to fuel oil. Fouling is not identified as an aging effect for fuel oil.

    SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel piping, piping components, piping elements, and tanks exposed to fuel oil. The existing AMP relies on fuel oil chemistry programs to monitor and control fuel oil contamination to manage loss of material due to corrosion or fouling. Corrosion or fouling may occur at locations where contaminants accumulate. The effectiveness of fuel oil chemistry programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, MIC, and fouling to verify the effectiveness of fuel oil chemistry programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted the applicant's statement in the LRA that fouling is not identified as an aging effect for fuel oil. However, the staff could find no basis for that statement provided in the LRA. The staff issued RAI 3.3.2.2.9.1-1 by letter dated July 15, 2008, asking the applicant to provide a basis for the statement that fouling is not identified as an aging effect for fuel oil.

In a letter dated August 15, 2008, the applicant responded to RAI 3.3.2.2.9.1-1 by providing the following response:

The quality of fuel oil is verified upon receipt and before it is delivered to the plant's fuel oil storage tanks, and introduced into the fuel oil system, to ensure that it does not contain contaminants, such as sediment, that could cause fouling. The potential for water contamination in the fuel oil during transfer and storage is, however, assumed. Therefore, the only foulants that would be expected in the fuel oil would be those that result from corrosion of steel piping and components, i.e., corrosion products. By managing loss of material due to general, pitting, crevice, and microbiologically induced corrosion, corrosion products will be controlled, and fouling will not occur. Therefore, fouling is not identified as an aging effect for fuel oil.

The staff reviewed the applicant's response and finds its acceptable because it provides a reasonable technical justification, based on fuel oil testing upon receipt, prior to introducing the fuel oil into the fuel oil storage tanks, and on control of potential corrosion products, as to why fouling is not expected to occur for steel components exposed to a fuel oil environment. The issues raised in RAI 3.3.2.2.9.1-1 are resolved by the applicant's response.

The staff reviewed the applicant's Fuel Oil Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.11, found that the Fuel Oil Chemistry Program provides aging management for loss of material due to general, pitting, and crevice corrosion and MIC through monitoring and control of fuel oil contamination such as water or microbiological organisms. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components determined to be most susceptible to the aging effect(s) of interest and is capable of detecting loss of material due to general, pitting and crevice corrosion, and MIC, if it should occur in the selected components. Based on the applicant's use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the potential aging effect of loss of material due to general, pitting, and crevice corrosion, and MIC for steel piping, piping components, piping elements, and tanks exposed to fuel oil in the diesel fuel oil system and in the fire protection system to be acceptable.

(2) LRA Section 3.3.2.2.9 addresses loss of material due to general, pitting, crevice, MIC and fouling in piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that loss of material due to general, pitting, and crevice corrosion and MIC for steel piping components exposed to lubricating oil is managed by the

Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion and MIC through examination of steel piping components. The Lubricating Oil Analysis Program will also manage reduction in heat transfer due to fouling of heat exchanger tubes exposed to lubricating oil. For those heat exchangers within the scope of Generic Letter 89-13 for SSES, the Piping Corrosion Program is credited with managing fouling of heat exchanger tubes exposed to lubricating oil.

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff verified that only heat exchanger components that align to GALL AMR VII.H2-5 for the Control Structure Chilled Water system that are fabricated from steel materials are applicable to SSES.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13 respectively. The staff reviewed the applicant's Lubricating 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 microbiologically-influenced corrosion in steel piping, piping components, and piping elements exposed to lubricating oil. The staff verified that the applicant has credited its Lubricating Oil Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program to manage this aging effect. The applicant’s AMPS are consistent with those recommended for aging management in SRP-LR Section 3.3.2.2.9, Item #2 and in GALL AMR Item VII.H2-5.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.9 criteria. For those line items that apply to LRA Section 3.3.2.2.9, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.3.2.2.10 against the following criteria in SRP-LR

Section 3.3.2.2.10:

(1) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in steel piping with elastomer lining or stainless steel cladding. The applicant stated that this aging effect is not applicable because elastomer linings are not credited for protection of metallic components, and are therefore, not subject to AMR. There are no steel with stainless steel cladding piping components that are exposed to treated water or treated borated water in the Auxiliary Systems for SSES.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding exposed to treated water and treated borated water if the cladding or lining is degraded. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

For applicable steel BWR piping, SRP-LR Section 3.3.2.2.10.1 invokes AMR Item 22 in Table 3 of the GALL Report, Volume 1, and GALL AMR Item VII.A4-12, applicable to the steel piping in the spent fuel pool cooling and cleanup (purification) systems designed with elastomeric linings or stainless steel cladding, where the elastomeric lining or stainless steel cladding has been determined to be degraded and the underlying steel material is exposed to treated water or borated treated water.

The staff verified that the LRA does not credit internal elastomeric liners in the components of the fuel pool cooling and cleanup system, or fuel pool auxiliaries for aging management. The staff also verified that the steel piping components in the SSES fuel pool cooling and cleanup systems and fuel pool auxiliaries do not include any internal stainless steel cladding. Based on this review, the staff concludes that the applicant has provided an acceptable basis for concluding that the supplemental evaluation recommendations in SRP-LR Section 3.3.2.2.10.1 and in GALL AMR VII.A4-12 are not applicable to the LRA because the staff has verified that the applicant does not credit any elastomeric liner in the fuel pool cooling and cleanup systems for aging management and because the staff has verified that the fuel pool cooling and cleanup systems do not include any steel components that are lined with internal stainless steel cladding.

(2) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in piping, piping components, piping elements, and heat exchanger components. The applicant stated that loss of material due to pitting and crevice corrosion for stainless steel heat exchanger components exposed to treated water is managed by the Closed Cooling Water Chemistry Program. The Closed Cooling Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and aluminum piping, piping components, piping elements, and for stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed LRA Section 3.3.2.2.10.2 and the discussions in LRA Table 3.3.1, items 3.3.1 23 and 3.3.1 24, against the criteria in SRP-LR Section 3.3.2.2.10, item 2, which states that loss of material due to pitting and crevice corrosion may occur in stainless steel and aluminum piping, piping components, piping elements, and for stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water. The SRP-LR states that the existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. The SRP-LR states that a one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that the only AMR results referring to LRA Table 3.3.1, item 3.3.1 23, are for stainless steel heat exchanger components associated with diesel generator jacket water cooling. By letter dated August 12, 2008 and December 11, 2008 the applicant amended its LRA such that aluminum heat exchanger components associated with diesel generator lubricating oil cooling references LRA Table 3.3.1, item 3.3.1 24, in response to RAI B.2.14-2. For the stainless steel components, which are exposed to treated water in the closed cooling water system, as amended by its supplemental response to RAI B.2.14-2 by letter dated December 11, 2008 the applicant proposed to manage loss of material due to pitting and crevice corrosion using the Closed Cooling Water Chemistry Program and and the Chemistry Program Effectiveness Inspection in lieu of the Water Chemistry and One-Time Inspection programs as recommended in the GALL Report.

The staff reviewed the applicant’s Closed Cooling Water Chemistry Program. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.2.7, found that the Closed Cooling Water Chemistry Program provides mitigation for the aging effect of loss of material due to corrosion by control of closed cooling water system chemistry consistent with applicable EPRI water chemistry guidelines. In addition, the Closed Cooling Water Chemistry Program includes monitoring for corrosion and is supplemented by a separate one-time inspection of other, representative areas serviced by the closed cooling water system. The one-time inspections are performed as part of the Chemistry Program Effectiveness Inspection, which the staff evaluates in SER Section 3.0.3.1.10. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage loss of material and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. Because the Closed Cooling Water Chemistry Program provides both mitigation of, and monitoring for pitting and crevice corrosion and the applicant will confirm the effectiveness of its chemistry program with a one-time inspection performed by the Chemistry Program Effectiveness Inspection the staff finds use of the Closed Cooling Water Chemistry Program and the Chemistry Program Effectiveness Inspection acceptable for managing the aging effect of loss of material due to pitting and crevice corrosion in stainless steel heat exchanger components exposed to treated water in the diesel generator jacket water cooling subsystem.

In LRA Table 3.3.1, Item 3.3.1-24, the applicant stated that the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection are credited to manage loss of material for stainless steel and aluminum components exposed to treated water. The applicant also stated that the BWR Water Chemistry Program, alone, is credited to manage loss of material for spent fuel storage racks made of aluminum. Furthermore, the applicant stated that the BWR Water Chemistry Program, alone, is credited to manage cracking of aluminum components exposed to treated water; however, that statement was deleted from the LRA as part of the applicant's response to RAI 3.3-2, discussed both near the end of this subsection and in SER Subsection 3.3.2.3.3.

The staff noted that for all stainless steel components where the AMR results are referenced to LRA Table 3.3.1, item 3.3.1-24, the aging effect is loss of material due to pitting and crevice corrosion and the applicant states that this aging effect will be managed by a combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection. These results are consistent with AMR results in the GALL Report for the same material, environment and aging effect combination.

The staff noted that there are three AMR result lines referenced to LRA Table 3.3.1, item 3.3.1 24 where the material is aluminum. One of the lines is for aluminum accumulator (pistons) in the control rod drive hydraulic system exposed to treated water where the aging effect of loss of material is managed with a combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection; this AMR result is consistent with the GALL Report. One of the lines is for aluminum spent fuel pool storage racks exposed to treated water where the aging effect of loss of material is managed with the BWR Water Chemistry Program, alone; this AMR result is not consistent with the GALL Report, but it is acceptable, as discussed below. One of the lines is for aluminum accumulator (pistons) in the control rod drive hydraulic system exposed to treated water where the applicant proposed to managed the aging effect of cracking with the BWR Water Chemistry Program, alone; however, in response to RAI 3.3-2 the applicant revised the this AMR result and the LRA as discussed below and in SER Subsection 3.3.2.2.3.

In the LRA the applicant provides plant-specific note 0515 to explain use of the BWR Water Chemistry Program, alone, for managing loss of material from the aluminum spent fuel storage racks. In Note 0515 the applicant states that one-time inspection is not applicable for the spent fuel racks because the spent fuel pool does not contain areas of low or stagnant flow where pitting or crevice corrosion would likely occur. Note 0515 also refers to the GALL Report, Chapter VII.A2, where the Water Chemistry Program, alone, is credited with managing the aging effect of cracking due to stress corrosion cracking in stainless steel spent fuel storage racks. On the basis that there are no areas of low or stagnant flow in the spent fuel pool where contaminants causing corrosion might collect, and the applicant's proposed AMP is consistent with the AMP recommended in the GALL Report, Chapter VII.A2, item VII.A2-6, for similar stainless steel components in a spent fuel pool environment, the staff finds the applicant's use of the BWR Water Chemistry Program, alone, for managing loss of material from the aluminum spent fuel storage racks in a treated water environment to be acceptable.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to general, crevice and pitting corrosion. The staff reviewed the Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the applicant's Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to general, pitting or crevice corrosion, if it should occur in the selected components. Based on the applicant's use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's use of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection for managing the potential aging effect of loss of material due to pitting and crevice corrosion for stainless steel and aluminum components exposed to treated water to be acceptable.

In LRA Table 3.3.2-3 (page 3.3-103), the applicant identified the aging effect of cracking as applicable for the aluminum pistons in the control rod drive accumulators which are exposed to an environment of treated water. The applicant proposed use of the BWR Water Chemistry Program, alone, for managing this aging effect in this component and cited generic Note H, indicating that the aging effect is not in the GALL Report for the component, material and environment combination. The staff issued RAI 3.3-2 by letter dated July 15, 2008, asking that the applicant provide further information to justify that the BWR Water Chemistry Program, alone, without an inspection to confirm program effectiveness, provides adequate aging management for this component. The RAI also asked the applicant to explain why the aging effect of cracking is referenced to LRA Table 3.3.1, item 3.3.1-24, where the aging effect is loss of material due to pitting and crevice corrosion.

In a letter dated August 15, 2008, the applicant responded to RAI 3.3-2 by providing the following response:

For the AMR results item listed on page 3.3-103 of the LRA for accumulator (pistons) made of aluminum in a treated water environment with an aging effect of cracking, Note H is the appropriate generic note because the aging effect, cracking, is not in the GALL Report for aluminum exposed to treated water. However, because the GALL Report item VIII.E3-7 is for loss of material, the GALL Report Volume 2 item number and the Table 1 item number should have been identified as "N/A."

For this AMR result item, verification of the effectiveness of the BWR Water Chemistry Program is needed to confirm that cracking is not occurring in these components.

As part of the RAI response, the applicant revised the AMR result line in LRA Table 3.3.2 3, page 3.3-103. The revised AMR result line shows that for accumulators (pistons) made of aluminum in a treated water environment the aging effect of cracking will be managed by a combination of the BWR Water Chemistry Program and the Chemistry Program Effectiveness Inspection. Generic Note H continues to apply for this AMR result line, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. The revised AMR result line no longer refers to GALL Volume 2 or LRA Table 1 items, and the staff's evaluation of this AMR result, as revised, is documented in SER Subsection 3.3.2.3.3.

The applicant responded to RAI B.2.14-2 by letter dated August 12, 2008 and supplemented its response by letter dated December 11, 2008. It is response and supplemental response the applicant amended its LRA such that the material-environment-aging effect combination of aluminum-treated water (internal)-loss of material referenced LRA Table 3.3.1, item 3.3.1 24. For the aluminum components, which are exposed to treated water in the closed cooling water system, the applicant proposed to manage loss of material due to pitting and crevice corrosion using a combination of the Closed Cooling Water Chemistry Program and the Chemistry Program Effectiveness Inspection in lieu of the Water Chemistry and One-Time Inspection programs as recommended in the GALL Report.

The staff reviewed the applicant's Closed Cooling Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.7, found that the Closed Cooling Water Chemistry Program provides mitigation for the aging effect of loss of material due to corrosion by control of closed cooling water system chemistry consistent with applicable EPRI water chemistry guidelines. In addition, the Closed Cooling Water Chemistry Program includes monitoring for corrosion and is supplemented by a separate one-time inspection of other, representative areas serviced by the closed cooling water system. The one-time inspections are performed as part of the Chemistry Program Effectiveness Inspection, which the staff evaluates in SER Section 3.0.3.1.10. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage loss of material and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. Because the Closed Cooling Water Chemistry Program provides both mitigation of, and monitoring for pitting and crevice corrosion and the applicant will confirm the effectiveness of its chemistry program with a one-time inspection performed by the Chemistry Program Effectiveness Inspection the staff finds use of the Closed Cooling Water Chemistry Program and the Chemistry Program Effectiveness Inspection acceptable for managing the aging effect of loss of material due to pitting and crevice corrosion in aluminum heat exchanger components exposed to treated water in the diesel generator lubricating oil cooling subsystem.

(3) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in HVAC piping, piping components, and piping elements. The applicant stated that the Cooling Units Inspection is a one-time inspection that will detect and characterize loss of

material due to pitting and crevice corrosion for copper alloy HVAC piping components in an external environment with potential for wetting.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy heating, ventilation, and air conditioning (HVAC) piping, piping components, and piping elements exposed to condensation (external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The GALL report, under Items VII.F1-16, VII.F2-14, VII.F3-16 and VII.F4-12 recommends that a plant-specific program be credited to manage this aging effect for copper alloy HVAC piping, piping components and piping elements in the Auxiliary Systems.

The staff verified that only heat exchanger components, piping and piping components and valve bodies that align to GALL AMRs VII.F1-16, VII.F2-14 and VII.F4-12 for the Domestic Water System, Emergency Service Water System, Fire Protection System, Raw Water Treatment System, Reactor Building Chilled Water System, RHR Service Water System, Sampling System, Service Water System, Control Structure Chilled Water System and Diesel Generator System that are fabricated from copper alloy materials are applicable to SSES that credit the System Walkdown Program.

The staff reviewed the applicant's System Walkdown Program and its evaluation is documented in SER Sections 3.0.3.1.9. The staff determined that the System Walkdown Program which includes periodic visual inspections performed during system walkdowns, are adequate to manage loss of material due to pitting and crevice corrosion for copper alloy HVAC piping, piping components, and piping elements exposed to indoor and outdoor air environment with the potential for wetting addressed by this AMR. The staff finds that the System Walkdown Program performs periodic visual inspections of external surfaces during periodic system to detect aging effects that could result in a loss of the component's intended function. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and that it is adequate to manage loss of material due to pitting and crevice corrosion for copper alloy HVAC piping, piping components and piping elements exposed condensation on the external surface.

The staff reviewed the applicant’s Cooling Units Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Cooling Units Inspection Program is documented in SER Section 3.0.3.1.11. Because the Cooling Units Inspection is performed at selected susceptible locations, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Cooling Units Inspection Program will adequately manage the aging effects of loss of material in this wetted environment.

(4) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that loss of material due to pitting and crevice corrosion for copper alloy piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection

will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to pitting and crevice corrosion through examination of copper alloy piping components

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff verified that only piping, piping components and elements that align to GALL AMR VII.C2-5 and VII.H2-10 for the Fire Protection, Control Structure Chilled Water and Diesel Generator Lubricating Oil and NSAS Component systems that are fabricated from copper alloy materials are applicable to SSES.

The staff reviewed the applicant's Lubricating 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.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13 respectively. The staff verified that the applicant has credited its Lubricating Oil Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program to manage this aging effect. The applicant's AMPS are consistent with those recommended for aging management in SRP-LR Section 3.3.2.2.10, Item #4 and in GALL AMR Item VII.C2-5 and VII.H2-10.

Based on the program identified above, the staff concludes that the applicant's program meet SRP-LR Section 3.2.2.2.10 Item (4) criteria and therefore the applicant's AMRs are consistent with those under GALL Report Item VII.C2-5 and VII.H2-10. For those line items that apply to LRA Section 3.2.2.2.10 Item #4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

During its review, the staff noted that the applicant identified in LRA Table 3.3.2-4, Control Structure Chilled Water System, a Type-2 line item that utilized a standard note I and plant specific note 0310, claiming that the aging effect, loss of material due to pitting and crevice corrosion, is not applicable to SSES for this component, material and environment combination. The applicant states that this Type-2 item is not applicable to

SSES because this tubing that is exposed to lubricating oil internally is made of copper with less than 15% zinc, therefore is not susceptible to this aging effect and environment combination. The staff verified in the GALL Report, Chapter IX.C that components made of copper alloy with less than 15% zinc are resistant to loss of material due to pitting and crevice corrosion. Based on this assessment, the staff concludes that this Type-2 item in LRA Table 3.3.2-4 is not applicable to SSES.

(5) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in HVAC piping, piping components, and piping elements and ducting. The applicant stated that the Cooling Units Inspection is a one-time inspection credited with detecting and characterizing the condition of aluminum and stainless steel HVAC components exposed to condensation. The System Walkdown Program is credited for managing loss of material due to pitting and crevice corrosion for the external surfaces of stainless steel HVAC components exposed to condensation.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The GALL report, under Item VII.F1-1, VII.F2-1, VII.F3-1, VII.F1-14, VII.F2-12, VII.F3-14 and VII.F4-10 recommends that a plant-specific program be credited to this aging effect for stainless steel ducting and components and piping elements in the Auxiliary Systems.

The staff verified that only ducting and components that align to GALL AMRs VII.F1-1, VII.F2-1 and VII.F3-1 for the Emergency Service Water System, Fire Protection System, Fuel Pool Cooling System, Primary Containment Atmosphere Circulation System, Process and Area Radiation Monitoring System, Reactor Building Chilled Water and HVAC System, RHR Service Water System, Sampling System and Control Structure Chilled Water System that are fabricated from stainless steel and steel materials are applicable to SSES that credit the Systems Walkdown Program.

The staff reviewed the applicant's System Walkdown Program and its evaluation is documented in SER Sections 3.0.3.1.9. The staff determined that the System Walkdown Program which includes periodic visual inspections performed during system walkdowns, are adequate to manage loss of material due to pitting and crevice corrosion for stainless steel and steel ducting and components exposed to indoor and outdoor air environment with the potential for wetting addressed by this AMR. The staff finds that the System Walkdown Program performs periodic visual inspections of external surfaces during periodic system to detect aging effects that could result in a loss of the component's intended function. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and that it is adequate to manage loss of material due to pitting and crevice corrosion for stainless steel and steel ducting and components exposed indoor and outdoor air with the potential for wetting on the external surface.

Subsection 3.3.2.2.10.5 is referenced in the LRA Table 3.3.1 for line item 3.3.1-27. In the discussion column of Table 3.3.1, item 3.3.1-27, the LRA states that the Cooling Units Inspection will also detect and characterize cracking of aluminum HVAC cooling unit fins, for which Note H is used. However, a review of Table 2s did not identify a line item where this is identified. The staff issued RAI 3.3.1-6 by letter dated July 9, 2008 to request the applicant to clarify where in Table 2s the Cooling Units Inspection is credited for managing cracking of aluminum HVAC cooling unit fins.

In its letter dated August 8, 2008, the applicant responded to RAI 3.3.1-6 by stating that the Cooling Unit Inspection Program is not credited for managing cracking of aluminum HVAC cooling unit fins. The applicant revised LRA Table 3.3.1, item 3.3.1-27 and the associated LRA Section 3.3.2.2.10.5 to remove the statement crediting the Cooling Unit Inspection Program in conjunction with cracking of aluminum HVAC cooling unit fins.

The staff reviewed the applicant’s response and the LRA revision. With the removal of the statement crediting the Cooling Unit Inspection Program for cracking of aluminum HVAC cooling fins, Table 3.3.1. item 3.3.1-27 and Section 3.3.2.2.10.5 are consistent with Table 2s, where cracking of aluminum fins is not addressed and there is no discrepancy between Table 1 and Table 2. On this basis, the staff finds the response acceptable.

The staff reviewed the Cooling Units Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Cooling Units Inspection Program is documented in SER Section 3.0.3.1.11. Because the Cooling Units Inspection is performed at selected susceptible locations, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Cooling Units Inspection Program will adequately manage the aging effects of loss of material in this wetted environment.

In the discussion column of Table 3.3.1, item 3.3.1-27, the LRA states that the System Walkdown Program, the Cooling Units Inspection, and the Supplemental Piping/Tank Inspection are credited to manage loss of material and references Section 3.3.2.2.10.5 for further evaluation. However, Section 3.3.2.2.10.5 does not address the Supplemental Piping/Tank Inspection. The staff issued RAI 3.3.10.2.5-1 by letter dated July 9, 2008 to request the applicant to resolve this discrepancy.

In its letter dated August 8, 2008, the applicant responded to RAI 3.3.10.2.5-1 by amending the LRA to add the following in LRA Section 3.3.2.2.10.5

> The Supplemental Piping/Tank Inspection is a one-time inspection credited with detecting and characterizing the condition of stainless steel components that are exposed to moist air, particularly the aggressive alternate wet/dry environment that exists at air-water interfaces.

On the basis that the applicant amended the LRA to resolve the discrepancy between Table 3.3.1, item 3.3.1-27 discussion column and this Subsection, the staff finds the response acceptable. The Supplementary Piping/Tank Inspection Program is discussed below.

In Table 3.3.2-14, Fuel Pool Cooling System, item 3.3.1-27 is referenced on three line items, stainless steel piping (in two environments) and stainless steel skimmer surge tanks. Table 3.3.2-14 also references for these three line items footnote 0303, which states that loss of material is due to crevice and/or pitting corrosion caused by alternate wetting and drying, not condensation, at the air-water interface. The applicant has chosen to apply SRP-LR Section 3.3.2.2.10.5 to these three line items, even though the stainless piping is in fuel pool cooling system with an environment similar to ventilation.

The applicant referenced GALL Report Volume 2, items VII.F1-1. The staff noted that where the GALL Report recommends a plant-specific aging management program, the applicant proposed using the Supplementary Piping/Tank Inspection Program.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff's evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations of air/water interface, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

(6) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in the fire protection system. The applicant stated that this aging effect is not applicable because the components are open to local ambient air conditions such that condensation will not occur and are not subject to continuous wetting or alternate wetting and drying that would constitute an aggressive environment.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff reviewed the GALL Report and noted that for copper alloy components in air-indoor environment, line item V.F-3 identifies no aging effect and no aging management program is required. On the basis that these copper alloy fire protection components are open to the atmosphere and do not see continuous wetting or alternate wetting and drying, the staff finds that consistent with the GALL Report, loss of material due to pitting and crevice corrosion is not an aging effect requiring management.

(7) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, and piping elements exposed to soil. The applicant stated that this aging effect is not applicable to auxiliary systems and is evaluated in steam and power conversion systems.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil.

LRA table 3.3.1 states that there are no SSES components comparable to LRA item number 3.3.1-29. The staff verified that there are no components that are comparable. The only stainless steel piping subject to aging management review for SSES that is exposed to soil is located in the Condensate Transfer and Storage System and is evaluated in the Steam and Power Conversion group for LRA item number 3.4.1-17. The staff's evaluation of the stainless steel piping exposed to soil in the Condensate

Transfer and Storage System is documented in SER Section 3.4.2.2.7.2.

(8) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in BWR SLC system. The applicant stated that loss of material due to pitting and crevice corrosion for stainless steel piping components exposed to sodium pentaborate solution is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to pitting and crevice corrosion through examination of stainless steel piping components exposed to sodium pentaborate solution.
SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements of the BWR SLC system exposed to sodium pentaborate solution. The existing AMP monitors and controls water chemistry to manage the aging effects of loss of material due to pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause loss of material due to pitting and crevice corrosion; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that this aging does not occur. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that loss of material due to pitting and crevice corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, determined that the BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to pitting and crevice corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to pitting or crevice corrosion, if it should occur in the selected components. Based on the applicant's use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the potential aging effect of loss of material due to pitting or crevice corrosion in stainless steel piping components exposed to sodium pentaborate solution in the standby liquid control system to be acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.10 criteria. For those line items that apply to LRA Section 3.3.2.2.10, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.11 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

The staff reviewed LRA Section 3.3.2.2.11 against the criteria in SRP-LR Section 3.3.2.2.11.

LRA Section 3.3.2.2.11 addresses loss of material due to pitting, crevice, and galvanic corrosion. The applicant stated that loss of material due to pitting, crevice, and galvanic corrosion for copper alloy piping components exposed to treated water is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to pitting, crevice, and galvanic corrosion through examination of copper alloy piping components exposed to treated water.

SRP-LR Section 3.3.2.2.11 states that loss of material due to pitting, crevice, and galvanic corrosion may occur in copper alloy piping, piping components, and piping elements exposed to treated water. Therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that this aging does not occur. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that loss of material due to pitting and crevice corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, determined that the BWR Water Chemistry Program provides mitigation for the aging effect of loss of material due to pitting, crevice and galvanic corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to pitting, crevice or galvanic corrosion, if it should occur in the selected components. Based on the applicant's use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the potential aging effect of loss of material due to pitting, crevice or galvanic corrosion in copper alloy piping components exposed to treated water in the reactor water cleanup system and in the control rod drive hydraulic system to be acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.11 criteria. For those line items that apply to LRA Section 3.3.2.2.11, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.12 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.12 against the following criteria in SRP-LR Section 3.3.2.2.12:

(1) LRA Section 3.3.2.2.12 addresses loss of material due to pitting, crevice, and MIC in piping, piping components, and piping elements exposed to fuel oil. The applicant stated that there are no aluminum piping components exposed to fuel oil that are subject to aging management review for SSES. Loss of material due to pitting and crevice corrosion and MIC for stainless steel and copper alloy piping components exposed to

fuel oil is managed by the Fuel Oil Chemistry Program. The Fuel Oil Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the Fuel Oil Chemistry Program to manage loss of material due to pitting and crevice corrosion and MIC through examination of stainless steel and copper alloy piping components exposed to fuel oil. Though not credited, the Fire Protection Program provides indirect confirmation of whether degradation of these components has occurred, and that the component intended function is maintained.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil. The existing AMP relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination to manage loss of material due to corrosion; however, corrosion may occur at locations where contaminants accumulate and the effectiveness of fuel oil chemistry control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the fuel oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the applicant’s Fuel Oil Chemistry Program. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.2.1, found that the Fuel Oil Chemistry Program provides aging management for loss of material due to pitting and crevice corrosion and MIC through monitoring and control of fuel oil contamination such as water or microbiological organisms. The staff reviewed the applicant’s Chemistry Program Effectiveness Inspection. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report’s recommendations for AMP XI.M32, “One-Time Inspection.” The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components determined to be most susceptible to the aging effect(s) of interest and is capable of detecting loss of material due to loss of material due to pitting or crevice corrosion or MIC, if it should occur in the selected components. Based on the applicant’s use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant’s proposed AMPs for managing the potential aging effect of loss of material due to pitting and crevice corrosion and MIC for stainless steel or copper alloy piping components exposed to fuel oil in the diesel fuel oil system and in the fire protection system to be acceptable.

(2) LRA Section 3.3.2.2.12 addresses loss of material due to pitting, crevice, and MIC in piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that loss of material due to pitting and crevice corrosion and MIC for stainless steel piping components exposed to lubricating oil is managed by the Lubricating Oil Analysis Program. The Lubricating Oil Analysis Program manages aging effects through periodic monitoring and control of contaminants, including water. The Lubricating Oil Inspection will provide a verification of the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to pitting and crevice corrosion and MIC through examination of stainless steel piping components.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting, crevice, and MIC may occur in stainless steel piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff verified that only piping, piping components and elements that align to GALL AMR VII.H2-17 for the Diesel Generator Lubricating Oil system that are fabricated from stainless steel materials are applicable to SSES.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13 respectively. The staff reviewed the applicant's Lubricating 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 microbiologically-influenced corrosion in stainless steel piping, piping components, and piping elements exposed to lubricating oil. The staff verified that the applicant has credited its Lubricating Oil Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program to manage this aging effect. The applicant’s AMPS are consistent with those recommended for aging management in SRP-LR Section 3.3.2.2.12, Item #2 and in GALL AMR Item VII.H2-17.

Based on the program identified above, the staff concludes that the applicant’s program meet SRP-LR Section 3.3.2.2.12, Item #2 criteria and therefore the applicant’s AMRs are consistent with those under GALL Report Item VII.H2-17. For those line items that apply to LRA Section 3.3.2.2.12, Item #2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.12 criteria. For those line items that apply to LRA Section 3.3.2.2.12, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.13 Loss of Material Due to Wear

The staff reviewed LRA Section 3.3.2.2.13 against the criteria in SRP-LR Section 3.3.2.2.13.

LRA Section 3.3.2.2.13 addresses loss of material due to wear. The applicant stated that this aging effect is not applicable because wear only occurs during the performance of an active function, as a result of improper design, application or operation, or to a very small degree with insignificant consequences.

SRP-LR Section 3.3.2.2.13 states that loss of material due to wear may occur in the elastomer seals and components exposed to air - indoor uncontrolled (internal or external). The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

For applicable steel BWR piping, SRP-LR Section 3.3.2.2.13 invokes AMR Item 34 in Table 3 of the GALL Report, Volume 1, and GALL AMR Item VII.F1-5, VII.F1-6, VII.F2-5, VII.F2-6, VII.F3-5, VII.F3-6, VII.F4-4 and VII.F4-5, as applicable to the management of loss of material due to wear in elastomeric seals and components in control room area ventilation, auxiliary and radwaste area ventilation, primary containment heating and ventilation, and diesel generator building ventilation systems under internal and external exposure to uncontrolled indoor air.

The staff reviewed the information in LRA Section 3.3.2.2.13 against the staff's recommendations in SRP-LR Section 3.3.2.2.13 and in GALL AMR items Item VII.F1-5, VII.F1-6, VII.F2-5, VII.F2-6, VII.F3-5, VII.F3-6, VII.F4-4 and VII.F4-5, as applicable to the management of loss of material due to wear in elastomeric seals and components in control room area ventilation, auxiliary and radwaste area ventilation, primary containment heating and ventilation, and diesel generator building ventilation systems under internal and external exposure to uncontrolled indoor air.

The staff confirmed that the scope of the applicant's application includes the following AMR tables for auxiliary HVAC systems:

- Table 3.3.2-5, Aging Management Results for Control Structure HVAC Systems
- Table 3.3.2-8, Diesel Generator Buildings HVAC Systems
- Table 3.3.2-12, ESSW Pumphouse HVAC System
- Table 3.3.2-16, Primary Containment Atmosphere Circulation System
- Tabl3 3.3.2-23, Reactor Building HVAC System

The staff noted that these AMR Tables did not include any AMRs on management of loss of material due to wear in elastomeric HVAC seals and components or that were aligned to AMR Item 34 in Table 3 of the GALL Report, Volume 1, or to GALL AMR Item VII.F1-5, VII.F1-6, VII.F2-5, VII.F2-6, VII.F3-5, VII.F3-6, VII.F4-4 or VII.F4-5. The staff also noted that the applicant's basis for concluding that loss of material due to wear was based on a misplaced conclusion. Specifically, the staff noted that the applicant based its conclusion that loss of material due to wear was not an aging effect requiring management (AERM) on the fact that wear is an active loss of material mechanism and not on the fact that the elastomeric HVAC seals and components for which wear is plausible are active components or components that are replaced on a qualified or specified frequency. The staff noted that the fact that wear is an active loss of material mechanism did not provide any logical basis for concluding that wear was not plausible aging mechanisms for any passive, long-lived elastomeric seals or components in these HVAC systems.

In RAI 3.3.2.2.13-1, by letter dated July 23, 2008, the staff informed the applicant that the fact that wear is an active aging mechanism does not provide a valid or acceptable basis for concluding that the passive long-lived elastomeric HVAC seals or components are not subject to potential loss of material due to wear. In this RAI, the staff asked the applicant to provide a valid basis why loss of material due to wear is not considered to be an aging effect requiring management (AERM) for the elastomeric seals and components in the control structure HVAC systems, diesel generator building HVAC systems, ESSW pumphouse HVAC system, primary containment atmosphere circulation system, or reactor building HVAC system.

In its letter dated August 27, 2008, in response to RAI 3.3.2.2.13-1, the applicant provided the following bases, that have been documented in industry guidance on the aging of elastomers, upon which it concluded that loss of material due to wear is not an aging effect requiring management for elastomer seals and components:

- the elastomer seals and components were selected based on their suitability for the service in which they would be applied, i.e., they were properly designed;
- the elastomer seals and components were properly applied and installed, i.e., within allowable pre-compression and offset limits, thus preventing significant relative motion between the contacting surfaces; and,
- the systems in which the elastomer seals and components are installed are operated in accordance with procedures that have been developed based on standard industry good practices, thus preventing excessive vibration and unintended component movements
- flexible connections are used in applications where some movement between the joined piping, ductwork, and components is expected to occur. However, as indicated above, the flexible connections are securely attached to the joined components such that there is no relative movement between the connection of the flexible connection and the component. The flexible connection is designed to accommodate relative movements, however proper design and installation ensures that the flexible connection does not make contact with itself or with other nearby components.

Therefore, the applicant concluded that there is no relative motion expected between contacting surfaces and wear is not an aging effect requiring management.

The staff reviewed the applicant response and reviewed the definition of wear in the GALL Report Section IX.F. The GALL Report defines wear as the removal of surface layers due to relative motion between two surfaces or under the influence of hard abrasive powder. The GALL Report further states that wear occurs in parts that experience intermittent relative motion or frequent manipulation. The staff determined that use of flexible connections in systems that experience vibration minimizes relative motion of the piping system, thereby minimizing wear. These systems are designed to account for relative motion and therefore, the staff finds that for elastomeric seals and components in control room area ventilation, auxiliary and radwaste area ventilation, primary containment heating and ventilation, and diesel generator building ventilation systems under internal and external exposure to uncontrolled indoor air do not experience loss of material due to wear. On this basis the staff finds the applicant response acceptable.

Therefore, the staff concludes that loss of material due to wear is not an aging effect requiring management for elastomer seals and components exposed to air - indoor uncontrolled (internal or external).

Based on the above, the staff concludes SRP-LR Section 3.3.2.2.13 criteria are not applicable.

3.3.2.2.14 Loss of Material Due to Cladding Breach

The staff reviewed LRA Section 3.3.2.2.14 against the criteria in SRP-LR Section 3.3.2.2.14.

LRA Section 3.3.2.2.14 addresses loss of material due to cladding breach. The applicant stated that this aging effect is not applicable because SSES is a BWR.

SRP-LR Section 3.3.2.2.14 states that loss of material due to cladding breach may occur in PWR steel charging pump casings with stainless steel cladding exposed to treated borated water.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no steel with stainless steel cladding pump casing exposed to treated borated water, an environment only exist in PWR. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

Based on the above, the staff concludes SRP-LR Section 3.3.2.2.14 criteria are not applicable.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.3.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.3.2-1 through 3.3.2-34, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.3.2-1 through 3.3.2-34, the applicant indicated, via notes F through J that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.3.2.3.1 Aging Management Review Results - Building Drains Nonradioactive System – LRA Table 3.3.2-1

The staff reviewed LRA Table 3.3.2-1, which summarizes the results of AMR evaluations for the building drains nonradioactive system component groups.

In LRA Table 3.3.2-1, the applicant proposed to manage loss of material due for cast iron, carbon steel and copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” 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’s evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting loss of material and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-1, the applicant proposed to manage loss of material due to selective leaching for cast iron and copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.29 “Selective Leaching Inspection.”

The AMR line items credit the AMP B.2.29 “Selective Leaching Inspection” to manage loss of material due to selective leaching 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’s evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. The staff noted that the GALL Report recommends the use of the Selective Leaching Program for the same combination of material/environment/aging effect in items VII.C1-10, and VII.C1-11 for different systems. On the basis that the applicant will be performing a combination of a visual inspection and hardness test for these components and these AMR material/environment/aging effect combination is consistent with the GALL AMR

Item VII.C1-10 and VII.C1-11, for copper alloy and cast iron respectively, the staff finds the AMR results for this line item acceptable.

LRA Table 3.3.2-1 summarizes the results of AMRs for the Building Drains Nonradioactive System piping and piping components constructed out of copper alloy and exposed to indoor air (external). The applicant proposed no aging effect and therefore that no AMP is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for this component and material. The staff also agrees that there will not be any aging mechanism for this material/environment combination and that no AMP is required. 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 Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987).

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.2 Aging Management Review Results - Containment Instrument Gas System – LRA Table 3.3.2-2

The staff reviewed LRA Table 3.3.2-2, which summarizes the results of AMR evaluations for the containment instrument gas system component groups.

In LRA Table 3.3.2-2, the applicant proposed to manage cracking of copper alloy for heat exchanger shells in the Containment Instrument Gas System exposed to an internal environment of treated water using the AMP B.2.14 "Closed Cooling Water Chemistry Program."

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, "Chemistry Program Effectiveness Inspection" will be used to supplement AMP B.2.14, "Closed Cooling Water Chemistry Program" in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant's AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

In LRA Table 3.3.2-2, the applicant proposed to manage loss of material due for carbon steel material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” 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’s evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting loss of material and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

LRA Table 3.3.2-2 summarizes the results of AMRs for the Containment Instrument Gas System copper alloy (brass) heat exchanger shells for compressors exposed to indoor air (external). The applicant proposed no aging effect and therefore that no AMP is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is “Environment not in NUREG-1801 for this component and material.” The staff confirmed that this environment is not in GALL for this component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination and that no AMP is required because copper alloy 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 which is much more severe than indoor air environment as cited in Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987).

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.3 Aging Management Review Results - Control Rod Drive Hydraulic System – LRA Table 3.3.2-3

The staff reviewed LRA Table 3.3.2-3, which summarizes the results of AMR evaluations for the CRD hydraulic system component groups.

In LRA Tables 3.3.2-3 the applicant proposed to manage cracking in copper alloy piping and piping components, and in aluminum accumulator (pistons), in an environment of treated water by using the BWR Water Chemistry Program. The applicant cited generic note H for these AMR results, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. In a letter dated July 15, 2008, the staff issued RAI 3.2 3, applicable for the copper components and for similar AMR results in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-25, and 3.4.2 3. In the same letter, the staff also issued RAI 3.3 2, applicable for the aluminum components. The RAIs asked the applicant to provide a technical justification as to why an inspection program, such as the Chemistry Program Effectiveness Inspection is not needed to confirm that the BWR Water Chemistry Program is effective in preventing the aging effect.

In a letter dated August 15, 2008, the applicant responded to RAI 3.2-3 and 3.3-2 by providing the following responses:

RAI 3.2-3 Response:
For the five AMR results lines listed in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3, where the material is copper alloy, the environment is treated water (internal), and the aging effect is cracking, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of this program in managing the effects of aging, including cracking in susceptible materials. LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3 are revised to reflect these results.

RAI 3.3-2 Response:
For the AMR results item listed on page 3.3-103 of the LRA for accumulator (pistons) made of aluminum in a treated water environment with an aging effect of cracking, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of this program in managing the effects of aging, including cracking of susceptible materials. The affected LRA Tables are revised.

The staff reviewed the applicant's response and the associated LRA changes. The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking due to stress corrosion cracking. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and uses examination techniques that are capable of detecting cracking, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection of the aging effect if it should occur, the staff finds the applicant's proposed AMPs for managing the potential aging effect of cracking in copper alloy piping and piping components and in aluminum accumulator (pistons) exposed to treated water in the control rod drive hydraulic system to be acceptable. On this basis, the staff finds that the issues raised in RAIs 3.2 3 and 3.3-2 are resolved by the applicant's LRA changes.

LRA Table 3.3.2-3 summarizes the results of AMRs for control rod drive hydraulics system piping and piping components constructed using copper alloy exposed to indoor air (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for the component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination, and that no AMP is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.4 Aging Management Review Results - Control Structure Chilled Water System – LRA Table 3.3.2-4

The staff reviewed LRA Table 3.3.2-4, which summarizes the results of AMR evaluations for the control structure chilled water system component groups.

In LRA Table 3.3.2-4, the applicant proposed to manage cracking of copper alloy for chiller evaporator and oil cooler tubes and plugs in the Control Structure Chilled Water System exposed to an internal and external environment of treated water using the AMP B.2.14 "Closed Cooling Water Chemistry Program."

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, "Chemistry Program Effectiveness Inspection" will be used to supplement AMP B.2.14, "Closed Cooling Water Chemistry Program" in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant's AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

In LRA Table 3.3.2-4, the applicant proposed to manage reduction of heat transfer for copper alloy greater than 15 percent zinc material for chiller oil cooler tube tubes exposed to an external environment of lubricating oil using the Lubricating Oil Analysis Program, supplemented by the Lubricating Oil Inspection. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, environment and material combination.

The staff evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13, respectively. The Lubricating Oil Analysis Program is an existing program, that when enhanced, will include sample locations from the Control Structure Chiller, and will properly monitor relevant conditions, such as particulate and water concentrations, viscosity, neutralization number and flash point, that can lead to start and spread of loss of material or reduction in heat transfer capability. The program's monitoring is based on manufacturer's recommendations, equipment importance and accessibility and American Society for Testing of Materials (ASTM) standards for lubricating oils. The applicant will supplement this program with the Lubricating Oil Inspection, which will provide direct evidence as to whether and to what extent reduction of heat transfer has occurred, thus providing evidence of the effectiveness of the Lubricating Oil Analysis Program. On the basis of its review, the staff finds that because these the lubricating oil in contact with these components will properly monitor relevant conditions, such as particulate and water concentrations, viscosity, neutralization number and flash point and then supplemented by a one-time inspection, "Lubricating Oil Inspection" to confirm program effectiveness that the aging effect of reduction in heat transfer of copper alloy greater than 15 percent zinc exposed to an external environment of lube oil will be adequately managed by these programs.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for valve bodies exposed to an external environment of indoor air using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item.

In Table 3.3.2-4, the LRA states that for glass skid-mounted sight glass components under internal exposure to an air-gas environment, there are no aging effects identified and no aging management program is required. The staff found that the plant specific AMR for the exposure of the glass skid-mounted sight glass components under internal exposure to an air-gas environment (an uncontrolled air environment) was consistent with the AMR in GALL Report item VII.J-08 for exposure of glass components to uncontrolled indoor air environments. Based on this review, the staff finds that the applicant has provided a valid basis for concluding that there are not any AERMs for the glass skid-mounted sight glass components because the applicant's AMR is consistent with GALL Report item VII.J-08.

LRA Table 3.3.2-4 summarizes the results of AMRs for the Control Structure Chilled Water System copper tubing (skid mounted) exposed to lubricating oil (internal). The applicant proposed no aging effect and therefore that no AMP is required.

The applicant has indicated that generic note I is applicable for these items. Generic note I is "Aging effect in NUREG-1801 for this component, material, and environment is not applicable." Plant specific note 310 stated that "copper contains less than 15% zinc, and therefore is not susceptible to loss of material in this environment." The staff agrees that there will not be an aging mechanism for this material/environment combination for copper tubing containing less than 15% Zn and that no AMP is required. The GALL Report line items V EP-11-I, VII AP-10-J and VIII SP-7-I have copper alloy exposed to lubricating oil with no aging effect and no aging management program required. The same will be true for the Control Structure Chilled Water System copper tubing because it has the same material/environment combination as the GALL Report Chapter V and VII material/environment and will have the same aging effect and aging management program.

LRA Table 3.3.2-4 summarizes the results of AMRs for the Control Structure Chilled Water System sight gauges (skid mounted) constructed from glass and exposed to air-gas (internal). The applicant proposed no aging effect and therefore that no AMP is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for this component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination and that no AMP is required. This conclusion is based on the fact that there have been no aging effects observed for glass components in this environment. Ref: Handbook of Glass Properties, N. P. Bansal and R. H. Doremua, Academic Press 1986, pg. 646.

The staff reviewed LRA Table 3.3.2-4 which summarizes the results of AMRs for the Control Structure Chilled Water System copper alloy (copper-nickel or brass) chiller tube plugs. The applicant proposed that this system meets the definitions given above and therefore the environment, aging effect requiring management, and AMR should be classified as not applicable. The staff agrees with this proposal because these components do not have an internal surface because they are solid and therefore, there will not be an aging effect requiring an AMP.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.5 Aging Management Review Results - Control Structure HVAC Systems – LRA Table 3.3.2-5

The staff reviewed LRA Table 3.3.2-5, which summarizes the results of AMR evaluations for the control structure HVAC systems component groups.

In LRA Table 3.3.2-5, the applicant proposed to manage cracking of copper alloy for heating and ventilation unit structure channels and cooling unit control and computer room channels in the Control Structure HVAC System exposed to an internal and external environment of treated water using the AMP B.2.14 “Closed Cooling Water Chemistry Program.”

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, “Chemistry Program Effectiveness Inspection” will be used to supplement AMP B.2.14, “Closed Cooling Water Chemistry Program” in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant’s AMP B.2.14 “Closed Cooling Water Chemistry Program” and AMP B.2.22 “Chemistry Program Effectiveness Inspection” and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

In LRA Table 3.3.2-5, the applicant proposed to manage loss of material due for carbon steel material for piping and piping components and humidifier housings exposed to an internal environment of raw water using the AMP B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” 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's evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by an qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting loss of material and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-5, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for the computer room floor cooling unit, control room floor cooling unit and the control structure heating and ventilation unit exposed to an external environment of indoor air using the AMP B.2.29 "Selective Leaching Inspection." By letter dated July 25, 2008 the applicant amended its LRA to credit AMP B.2.29 for aging management of these AMR line items.

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item

LRA Table 3.3.2-5 summarizes the results of AMRs for the Control Structure HVAC System cooling unit, cooling coils, copper alloy (brass), copper tubing, flow element valve bodies, computer and control room floor cooling coils, and aluminum flow elements exposed to ventilation (internal and external). The applicant proposed no aging effect and therefore that no AMP is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for this component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination and that no

AMP is required. The staff noted aluminum has an excellent resistance to corrosion when exposed to a humid air (outdoor environment). In most environments the aluminum oxide film bonds strongly to its surface and if damaged, reforms immediately. On a surface freshly abraded and then exposed to air, the oxide film is only 5 to 10 nanometers thick but highly effective in protecting the aluminum from corrosion. Therefore, aluminum exposed to an outdoor air environment has no applicable aging effect. (M. G. Fontana, "Corrosion Engineering, Third Edition, McGraw-Hill, 1986.) Copper alloy in an 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 Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987).

The staff reviewed LRA Table 3.3.2-5 which summarizes the results for the Control Structure HVAC System air strengtheners and fins constructed out of aluminum. The applicant proposed that this system meets the definitions given above and therefore the environment, aging effect requiring management, and AMR should be classified as not applicable. The staff agrees with this proposal because these components do not have an internal surface because they are solid and therefore, there will not be an aging effect requiring an AMP.

In LRA Table 3.3.2-5, the applicant proposed to manage reduction of heat transfer of aluminum cooling unit fins in an external environment of ventilation by using the Cooling Units Inspection Program. The applicant referenced footnote "H" for this line item indicating that aging effect is not in the GALL Report for this component, material and environment combination.

The staff noted the Cooling Unit Inspection Program will detect and characterize the condition of cooling unit components that are exposed to a ventilation environment, and provides direct evidence as to whether and to what extent, reduction of heat transfer has occurred, or is likely to occur that could result in a loss of intended function. In its letter dated July 25, 2008, the applicant responded to RAI B.2.23-2 stating that visual inspection (VT-3 or equivalent) techniques will be used to determine whether reduction in heat transfer is occurring. The applicant also stated that the specific inspection technique will be determined prior to the inspection activities and will be consistent with the recommendations in GALL AMP XI.M32. The staff's evaluation of the Cooling Units Inspection Program is documented in SER Section 3.0.3.1.11. Because the Cooling Units Inspection Program performs visual inspection to determine if any fouling has occurred that could cause reduction of heat transfer, and on the basis that the visual inspection technique will be consistent with the recommendation in GALL AMP XI.M32, the staff finds the Cooling Units Inspection Program will adequately manage the aging effect of reduction of heat transfer in cooling unit components exposed to a ventilation environment.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.6 Aging Management Review Results - Cooling Tower System – LRA Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of AMR evaluations for the cooling tower system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-6 are consistent with the GALL Report.

3.3.2.3.7 Aging Management Review Results - Diesel Fuel Oil System – LRA Table 3.3.2-7

The staff reviewed LRA Table 3.3.2-7, which summarizes the results of AMR evaluations for the diesel fuel oil system component groups.

In LRA Table 3.3.2-7 the applicant proposed to manage cracking in copper alloy level gauges, orifices, tubing, and valve bodies in an environment of fuel oil using the Fuel Oil Chemistry Program, alone. The staff noted that the Fuel Oil Chemistry Program does not include a component inspection activity and issued RAI 3.3-5 by letter dated July 15, 2008, asking the applicant to explain how effectiveness of the Fuel Oil Chemistry Program will be confirmed for these components.

In a letter dated August 15, 2008, the applicant responded to RAI 3.3-5 by providing the following response:

For the seven AMR result lines listed in LRA Table 3.3.2-7, where the aging effect is cracking and the AMP is designated as the Fuel Oil Chemistry Program, verification of the effectiveness of the Fuel Oil Chemistry Program is needed to confirm that cracking is not occurring in these components.

The Chemistry Program Effectiveness Inspection will detect and characterize the condition of materials managed by the Fuel Oil Chemistry Program. Implementation of the Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of this program in managing the effects of aging, including cracking of the susceptible materials.

The applicant revised the seven (7) affected lines in LRA Table 3.3.2-7 to show that the Fuel Oil Chemistry Program in combination with the Chemistry Program Effectiveness Inspection will be used to manage the aging effect of cracking for copper alloy components exposed to fuel oil in the diesel fuel oil system.

The staff reviewed the applicant’s Fuel Oil Chemistry Program. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.2.1, found that the Fuel Oil Chemistry Program provides aging management for loss of material and is also credited with mitigating the aging effect of cracking in susceptible materials through monitoring and control of fuel oil contamination such as water or microbiological organisms, which might produce ammonia that would cause cracking in copper alloy. The staff reviewed the applicant’s Chemistry Program Effectiveness Inspection. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report’s recommendations for AMP XI.M32, “One-Time Inspection.” The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components determined to be most susceptible to the aging effect(s) of interest and uses examination techniques that are capable of detecting cracking if it should occur in the selected components. Based on the applicant’s use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant’s proposed AMPs provide both mitigation and detection for the potential aging effect of cracking in copper alloy components exposed to fuel oil in the diesel fuel oil system. On this basis, the staff finds that the applicant’s proposed AMPs provide adequate aging management and that the issue raised in RAI 3.3-5 is resolved by the applicant’s LRA changes.

In LRA Table 3.3.2-7, the applicant proposed to manage loss of material due to selective leaching for cast iron and copper alloy material for level gauges, orifices, piping/tubing, pump casings and valve bodies exposed to an internal environment of fuel oil using the AMP B.2.29 “Selective Leaching Inspection.”

The AMR line items credit the AMP B.2.29 “Selective Leaching Inspection” to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff’s evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item.

In LRA Table 3.3.2-7, the applicant proposed to manage loss of material of carbon steel tanks in an external environment of ventilation by using the Supplementary Piping/Tank Inspection Program. The applicant referenced footnote “G” for this line item indicating that environment is not in the GALL Report for this component and material combination. The environment is an aggressive environment of air-water interface.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations of air/water interface, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

In Table 3.3.2-7, the LRA states that for synthetic rubber flexible connections in a fuel oil internal environment in the diesel fuel oil system, there are no aging effects requiring management. In RAI 3.3.2.3-1, part A by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations. In RAI 3.3.2.3-1, part B, the staff asked the applicant to identify those material properties that could be impacted by exposure of these materials and other materials such as plastic, synthetic rubber, butyl rubber and Teflon, to either a treated water, raw water, fuel oil, lubricating oil, ventilation air, indoor air, and air-gas (including Freon) environments. Finally, in RAI 3.3.2.3-1, part C, the staff asked the applicant to identify the AMP that will be credited for aging management if PPL does identify that are applicable AERMs for any of these system-material-environmental combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1 part A, the applicant stated that the applicable aging effects for elastomers (including butyl rubber, synthetic rubber, neoprene, and silicone) are change in material properties and cracking, which may be due to ionizing radiation, thermal exposure, and exposure to ultraviolet radiation or ozone. The applicant provided the threshold level for ionizing radiation as 10E6 rads, for temperature as greater than 95oF, and for ultraviolet radiation and ozone as prolonged exposure. The applicant further stated that, except for certain areas in the Reactor Building, where ionizing radiation could be more than the threshold limit, the other buildings are all in an environment that is within the threshold limits. Therefore, the applicant concluded that there are no aging effects requiring management for synthetic rubber flexible connections in a fuel oil internal environment in the diesel fuel oil system.

In response to RAI 3.3.2.3-1, part B, the applicant stated that the specific material properties that could be impacted by exposure to treated water, raw water, fuel oil, lubricating oil, ventilation air, indoor air, and air-gas (including Freon) environments are hardening (e.g., embrittlement, decrease in elasticity) and loss of strength (e.g., elongation, loss of tensile strength, and, with exposure to ionizing radiation, swelling or melting). The applicant further stated that hardening and loss of strength could occur as a result of prolonged exposure to high temperature, high radiation levels, or to ultraviolet radiation or ozone.

In response to RAI 3.3.2.3.-1, part C, the applicant stated that there are no aging effects requiring management for the system-material-environment combinations listed in RAI 3.3.2.3-1, except for those that have already been identified in the LRA as noted in the response to Part B.

The staff reviewed the applicant response to RAI 3.3.2.3-1, parts A, B and C, and finds the applicant response acceptable because the applicant defined the stressors that could cause the aging effects in various structures. The applicant response is consistent with the GALL Report definitions of the threshold limits of the stressors as recommended in the GALL Report Section IX. On the basis of its review, the staff finds for synthetic rubber flexible connections in a fuel oil internal environment in the diesel fuel oil system, there are no aging effects requiring management.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

LRA Table 3.3.2-7, summarizes the results of AMRs for the Diesel Fuel Oil System, orifices constructed using copper alloy (brass), level gauges (day tank) constructed from copper alloy (bronze), heat exchangers channels, covers and shells constructed from copper alloy (copper-nickel), valve bodies and tubing (and fittings) constructed from copper alloy (brass and bronze) exposed to indoor air (external), level gauges (day tank) constructed from copper alloy (brass) exposed to ventilation (internal), and piping and piping components constructed from copper and exposed to lubricating oil (internal). The applicant proposes that for these combinations of components, materials and environment conditions, there is no aging effect requiring management and therefore that no AMR is required.

The applicant has indicated that the GALL note G is applicable for these items. Note G is “Environment not in NUREG-1801 for this component and material.” The staff confirmed that this environment is not in the GALL for these components and materials. The staff also agrees that there will not be an aging mechanism for this material/environment combination and that no AMP is required. Copper alloy in an 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 Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987).

LRA Table 3.3.2-7 summarizes the results of an AMR for the Diesel Fuel Oil System piping and piping components constructed from carbon steel and exposed to outdoor air (external). The applicant claims that for these combinations of components, materials and environment there is no aging effect requiring management and therefore no AMR is required. The applicant references plant specific note 0361. Plant specific note 0361 states, Nonsafety-related vent and fill piping and piping components in the Diesel Fuel Oil System are normally empty and are attached to safety-related components (storage tanks or piping) that are anchored in below grade vaults or within Seismic Category I buildings. As such, degradation of the vent and fill piping or piping components will not result in a loss of support for safety-related components to which they are attached. Also, there is no high pressure, other motive force, or medium in the air to cause degradation." Because these components are normally empty, and because even if for some reason, they would fail, they would not affect the intended function of safety related components, and they are not in scope for license renewal the staff finds this to be acceptable.

The applicant also references Table 3.3.1-58 which covers "Steel external surfaces exposed to air–indoor uncontrolled (external), air–outdoor (external), and condensation (external)" and identifies the aging effect as "Loss of material due to general corrosion" and the AMP as External Surfaces Monitoring. The LRA, in the discussion section states "The System Walkdown Program also manages loss of material due to crevice and/or pitting corrosion due to condensation." The discussion states that this AMR is consistent with GALL while the line item in Table 3.3.2-7 reference note I, which states that the aging effect is not applicable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.8 Aging Management Review Results - Diesel Generator Buildings HVAC Systems – LRA Table 3.3.2-8

The staff reviewed LRA Table 3.3.2-8, which summarizes the results of AMR evaluations for the diesel generator buildings HVAC systems component groups.

LRA Table 3.3.2-8 summarizes the results of AMRs for the Diesel Generator Building HVAC System flexible connectors (ductwork) constructed from neoprene/fiberglass and neoprene/asbestos and neoprene exposed to ventilation (internal) and indoor air (external). The applicant proposes that these components, materials, environment combinations have no aging effects requiring management and therefore no AMP is required.

The applicant has indicated that generic note I is applicable for these items. Generic note I is "Aging effect in NUREG-1801 for this component, material, and environment is not applicable." The staff agrees that there will not be an aging mechanism for this material/environment combination.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.9 Aging Management Review Results - Diesel Generators System – LRA Table 3.3.2-9

The staff reviewed LRA Table 3.3.2-9, which summarizes the results of AMR evaluations for the diesel generators system component groups.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of material of nickel alloy (monel) for heat exchanger heating core tube plugs in the Diesel Generator Intake/Exhaust System exposed to an internal environment of treated water using the AMP B.2.14 "Closed Cooling Water Chemistry Program."

The AMR line item credits the AMP B.2.14 "Closed Cooling Water Chemistry 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 Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008 and supplemented its response by letter dated December 11, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, "Chemistry Program Effectiveness Inspection" will be used to supplement AMP B.2.14, "Closed Cooling Water Chemistry Program" in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant's SSES AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 for nickel alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage loss of material and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

In LRA Table 3.3.2-9, the applicant proposed to manage cracking of copper alloy for piping, piping components, tubing, fittings, valve bodies, heater immersion sheaths, and heat exchanger components in the Diesel Generator Lubricating Oil, Jacket Water, Intake/Exhaust and NSAS Component System exposed to an internal or external environment of treated water using the AMP B.2.14 "Closed Cooling Water Chemistry Program."

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, “Chemistry Program Effectiveness Inspection” will be used to supplement AMP B.2.14, “Closed Cooling Water Chemistry Program” in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant’s AMP B.2.14 “Closed Cooling Water Chemistry Program” and AMP B.2.22 “Chemistry Program Effectiveness Inspection” and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of material for aluminum material for heat exchanger shells exposed to an internal environment of lubricating oil using the Lubricating Oil Analysis Program, supplemented by the Lubricating Oil Inspection. 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 evaluated the Lubricating Oil Analysis Program and the Lubricating Oil Inspection Program, and the evaluations are documented in SER Sections 3.0.3.2.15 and 3.0.3.2.13, respectively. The Lubricating Oil Analysis Program is an existing SSES program that will properly monitor relevant conditions, such as particulate and water concentrations, viscosity, neutralization number and flash point that can lead to start and spread of loss of material or reduction in heat transfer capability. The program’s monitoring is based on manufacturer’s recommendations, equipment importance and accessibility and American Society for Testing of Materials (ASTM) standards for lubricating oils. The applicant will supplement this program with the Lubricating Oil Inspection, which will provide direct evidence as to whether and to what extent reduction of heat transfer has occurred, thus providing evidence of the effectiveness of the Lubricating Oil Analysis Program. On the basis of its review, the staff finds that because these the lubricating oil in contact with these components will properly monitor relevant conditions, such as particulate and water concentrations, viscosity, neutralization number and flash point and then supplemented by a one-time inspection, “Lubricating Oil Inspection” to confirm program effectiveness that the aging effect of loss of material of aluminum exposed to an external environment of lube oil will be adequately managed by these programs.

In LRA Table 3.2.2-9, the applicant proposed to manage reduction of heat transfer in copper alloy heat exchanger tubes in an external environment of lubricating oil by using the Piping Corrosion Program. The applicant referenced footnote H for this line item indicating that aging effect is not in the GALL Report for this component, material and environment combination. However, the staff noted that GALL Report item V.D2-9 has the same aging effect for this component, material and environment. The GALL Report recommends GALL AMP XI.M39, Lubricating Oil Analysis, and GALL AMP XI.M32, One-Time Inspection. Since the internal environment of these tubes is raw water, these heat exchangers are included in the GL 89-13 program. Therefore, the applicant is proposing to use the Piping Corrosion Program, which is consistent with GALL AMP XI.M20, Open-Cycle Cooling Water System.

The staff reviewed the Piping Corrosion Program, which is a combination of condition monitoring program (consisting of inspections, surveillances, and testing to detect the presence of, and to assess the extent of, fouling and loss of material) and a mitigation program (consisting of chemical treatments and cleaning activities to minimize fouling and loss of material). The staff's evaluation of the Piping Corrosion program is documented in SER Section 3.0.3.2.6. Because the Piping Corrosion Program includes both the chemistry treatment and cleaning for mitigation and inspection for verification, the staff finds that the Piping Corrosion Program will adequately manage the aging effects of reduction of heat transfer in copper alloy heat exchanger tubes in an external environment of lubricating oil through the period of extended operation.

In Table 3.3.2-9, the LRA states that for synthetic rubber flexible connections in a lubricating oil internal environment in the diesel generator system, there are no aging effects requiring management. In RAI 3.3.2.3-1, part A by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations. In RAI 3.3.2.3-1, part B, the staff asked the applicant to identify those material properties that could be impacted by exposure of these materials and other materials such as plastic, synthetic rubber, butyl rubber and Teflon, to either a treated water, raw water, fuel oil, lubricating oil, ventilation air, indoor air, and air-gas (including Freon) environments. Finally, in RAI 3.3.2.3-1, part C, the staff asked the applicant to Identify the AMP or AMPs that will be credited for aging management if PPL does identify that are applicable AERMs for any of these system-material-environmental combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1 part A, the applicant stated that the applicable aging effects for elastomers (including butyl rubber, synthetic rubber, neoprene, and silicone) are change in material properties and cracking, which may be due to ionizing radiation, thermal exposure, or exposure to ultraviolet radiation or ozone. The applicant provided the threshold level for ionizing radiation as 10E6 rads, for temperature as greater than 95oF, and for ultraviolet radiation and ozone as prolonged exposure. The applicant further stated that, except for certain areas in the Reactor Building, where ionizing radiation could be more than the threshold limit, the other buildings are all in an environment that is within the threshold limits. Therefore, the applicant concluded that there are no aging effects requiring management for synthetic rubber flexible connections in a lubricating oil internal environment in the diesel generator system.

In response to RAI 3.3.2.3-1, part B, the applicant stated that the specific material properties that could be impacted by exposure to treated water, raw water, fuel oil, lubricating oil, ventilation air, indoor air, and air-gas (including Freon) environments are hardening (e.g., embrittlement, decrease in elasticity) and loss of strength (e.g., elongation, loss of tensile strength, and, with exposure to ionizing radiation, swelling or melting). The applicant further stated that hardening and loss of strength could occur as a result of prolonged exposure to high temperature, high radiation levels, or to ultraviolet radiation or ozone.

In response to RAI 3.3.2.3.-1, part C, the applicant stated that there are no aging effects requiring management for the system-material-environment combinations listed in RAI 3.3.2.3-1, except for those that have already been identified in the LRA as noted in the response to part B.

The staff reviewed the applicant response to RAI 3.3.2.3-1, parts A, B and C, and finds the applicant response acceptable because the applicant defined the stressors that could cause the aging effects in various structures. The applicant response is consistent with the GALL Report definitions of the threshold limits of the stressors as recommended in the GALL Report Section IX. On the basis of its review, the staff finds for synthetic rubber flexible connections in a lubricating oil internal environment in the diesel generator system, there are no aging effects requiring management.

In Table 3.3.2-9, the LRA states that for plastic (Lucite) level gauges in internal ventilation, lubricating oil and external indoor air environments, and plastic (poly-carbonate) filters in air/gas internal and indoor air external environments in the diesel generator system, there are no aging effects requiring management. In RAI 3.3.2.3-1, by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1, the applicant stated that

Degradation of plastic materials is considered a design issue. Plastic is either completely resistant to the environment to which it is exposed, or it deteriorates. Acceptability for the use of plastics in any particular environment is a design-driven criterion, and once the appropriate material is chosen, the component will have no aging effects that require management. That is, the occurrence of any aging effects is considered a design deficiency that will be detected and corrected within the current license period.
Therefore, based on a review of industry operating experience and the expectation of proper design and application of the material, aging of plastics is not considered to require further evaluation for license renewal.

The staff reviewed the applicant response and concurs that the selection of plastic material is a design consideration for the system and environment; and once selected for the environment of ventilation, lubricating oil or indoor air, aging of plastic material is not expected. The staff acknowledges that plastic, like glass, is an impervious material and as identified in the GALL Report item VII.J-8, glass has no aging effects requiring management in an indoor air environment. The staff has not observed any age related industry experience for plastic material in internal ventilation or air/gas and external indoor air environments, and therefore, finds that for plastic (Lucite) level gauges in internal ventilation, lubricating oil and external indoor air environments, and plastic (poly-carbonate) filters in air/gas internal and indoor air external environments in the diesel generator system will not experience any aging effects requiring management.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

LRA Table 3.3.2-9 summarizes the results of AMRs for the Diesel Generators Lubrication Oil System heat exchangers end bells and shells constructed from aluminum and exposed to indoor air (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

LRA Table 3.3.2-9 summarizes the results of AMRs for Diesel Generators System starting air and intake/exhaust valve bodies constructed from nickel alloys (nickel-iron), valve bodies and orifices constructed from copper alloy (bronze), and filter bodies and heat exchanger fins constructed from aluminum exposed to indoor air (external) and ventilation (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

The staff finds that this conclusion is acceptable for nickel iron alloys because nickel iron alloys show very low corrosion rates in atmospheric exposure as discussed in F. L. LaQue and H. R. Copson, "Corrosion Resistance of Metals and Alloys," Second Edition, Reinhold Publishing Corporation, New York, 1963. The staff finds that this conclusion is acceptable for copper alloys because copper alloys 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 (which is more severe than indoor air or ventilation) as cited in Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987). The staff finds that his is acceptable for aluminum because aluminum exposed internally to an indoor air environment and externally to ventilation has no applicable aging effect as discussed in M. G. Fontana, "Corrosion Engineering, Third Edition, McGraw-Hill, 1986.

LRA Table 3.3.2-9 summarizes the results of AMRs for the Diesel Generators System intake/exhaust heat exchanger cooling core and heating core tube plugs constructed from nickel alloys (model), heat exchanger cooling core and heating core tube sheets constructed from copper alloy (copper-nickel), heat exchanger cooling core and heating core tubes constructed from copper alloy (copper-nickel) exposed to ventilation (external), heat exchanger water boxes constructed from copper alloy (copper-nickel), and valve bodies constructed from copper alloy (bronze) and exposed to indoor air (exterior), and filter housings constructed from galvanized steel exposed to outdoor air (exterior). For these components, materials and environment combinations, the applicant proposed no aging effect requiring management and no requirement for an AMP.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in the GALL Report for these components and materials. The staff agrees that there will be no aging effect for the tube plugs because they are not exposed to an external environment. The staff agrees with this position because these components do not have an external surface in contact with an environment because their external surface is in contact with the inside of the heat exchanger tubes.

The staff also agrees that there will not be an aging mechanism for the remaining material/environment combinations and that no AMP is required. The staff noted items include the external surface of components (e.g., heat exchanger shells, piping and piping components, and tanks) that do not contain chilled water, raw water, domestic water or cooling unit drainage and, therefore, do not experience condensation. For copper alloys, items match GALL items V.F-3 and VIII.I-2 for closed water systems, but no such item exists in GALL (Chapter VII) for closed cooling water auxiliary systems.

LRA Table 3.3.2-9 summarizes the results of AMRs for diesel generators NSAS components, process system piping and piping components constructed using copper alloy exposed to indoor air (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for the component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination, and that no AMP is required.

LRA Table 3.3.2-9 summarizes the results of AMRs for the Diesel Generator intake/exhaust heat exchanger fins constructed from aluminum, diesel generators jacket water heat exchanger tube plugs constructed from copper alloy (copper-nickel) and stainless steel. The applicant proposed that this system meets the definitions given above and therefore the environment, aging effect requiring management, and AMR should be classified as not applicable. The staff agrees with this proposal because these components do not have an internal surface.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.10 Aging Management Review Results - Domestic Water System – LRA Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of AMR evaluations for the domestic water system component groups.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material due for copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 "Area-Based NSAS Inspection."

The AMR line items credit the AMP B.2.46 "Area-Based NSAS Inspection" 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's evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting loss of material and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-10, the applicant proposed to manage cracking for copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP

B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” to manage cracking 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’s evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting cracking and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction (e.g., leakage) with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components exposed to an internal environment of raw water and external environment of indoor air using the AMP B.2.29 “Selective Leaching Inspection.”

The AMR line items credit the AMP B.2.29 “Selective Leaching Inspection” to manage loss of material due to selective leaching 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’s evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item.

In Table 3.3.2-10, the LRA states that for glass liner in the domestic water tank under internal exposure to a raw water environment, there are no aging effects identified and no aging management program is required. In RAI 3.3.2.3-1, Part A by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1 Part A, the applicant stated that:

> The relevant conditions that could result in aging degradation of glass are high

temperature water, and/or the presence of hydrofluoric acid or caustic alkalis. Hydrofluoric acid and caustic alkalis are not expected to exist in the in the raw water environment of the domestic water system. When hot water attacks glass, it is not dissolved in the usual sense but is hydrolytically decomposed. Resistance to water varies from excellent to poor depending on the composition of the glass. Furthermore, glass-lined steel combines the corrosion resistance of glass with the strength of steel, making it useful for equipment operating at elevated temperature and pressure. Glass-lined steel has excellent resistance to corrosion over a wide range of pH and environments. As such, it is expected that the glass lining for the water heater tank is properly designed and selected for the service in which it is used. Therefore, there are no aging effects requiring management for the subject glass components in the domestic water system.

The staff found that the plant specific AMR for the exposure of the glass liner in the domestic water tank under internal exposure to a raw water environment was consistent with the AMR in GALL AMR item VII.J-11 for exposure of glass components to raw water environments. Based on this review, the staff finds that the applicant has provided a valid basis for concluding that there are not any AERMs for the glass lining in the domestic water system tank because the applicant's AMR is consistent with GALL AMP VII.J-11.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.11 Aging Management Review Results - Emergency Service Water System – LRA Table 3.3.2-11

The staff reviewed LRA Table 3.3.2-11, which summarizes the results of AMR evaluations for the emergency service water system component groups.

In LRA Table 3.3.2-11, the applicant proposed to manage loss of material for stainless steel material for piping and piping components exposed to an external environment of outdoor air using the AMP B.2.32 "System Walkdown Program."

The AMR line item credits the AMP B.2.32 "System Walkdown 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's evaluation of the AMP B.2.32 "System Walkdown Program" is documented in SER Section 3.0.3.2.15. The staff determined that this program is a condition monitoring program that will detect the aging effect of loss of material for metals, including stainless steel, by periodic surveillance activities and observations of components' external surfaces to detect aging degradation that are with in the scope of license renewal. The staff also determined that these activities are adequate to manage loss of material for stainless steel piping and piping components exposed to air-outdoor. On this basis, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-11, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 "Area-Based NSAS Inspection."

The AMR line items credit the AMP B.2.46 "Area-Based NSAS Inspection" to manage loss of material for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting cracking and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-11, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components exposed to an external environment of indoor air using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components within the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.12 Aging Management Review Results - ESSW Pumphouse HVAC System – LRA Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of AMR evaluations for the ESSW Pumphouse HVAC system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-12 are consistent with the GALL Report.

3.3.2.3.13 Aging Management Review Results - Fire Protection System – LRA Table 3.3.2-13

The staff reviewed LRA Table 3.3.2-13, which summarizes the results of AMR evaluations for the fire protection system component groups.

In LRA Table 3.3.2-13, the applicant proposed to manage loss of material due to selective leaching for cast iron, gray cast iron and copper alloy material for heat exchanger components, piping, piping components and elements, strainers and sprinkler heads exposed to an external environment of indoor air using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item

In LRA Table 3.3.2-13, the applicant proposed to manage loss of material due to selective leaching for cast iron pump casings exposed to an internal environment of fuel oil using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item.

In LRA Table 3.3.2-13, the applicant proposed to manage loss of material due to selective leaching for cast iron pump casings and copper alloy tubing exposed to an internal environment of lubricating oil using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-13, the LRA states that for copper alloy sprinkler heads in indoor air, outdoor air and ventilation environments there are no aging effects. The applicant has referenced footnotes "G" and "0322". Footnote "0322" states that the Fire Water System Program is credited with aging management for all sprinkler heads, regardless of whether aging effects requiring management have been identified.

The staff has determined that copper alloy in an indoor, uncontrolled air environment exhibits no aging effect and that the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation. This conclusion is based on the fact that comprehensive tests conducted over a 20-year period under the supervision of ASTM have confirmed the suitability of copper and copper alloy for atmospheric exposure as cited in Metals Handbook, Volume 13, Corrosion, American Society for Metals, 1987. Based on this review, the staff finds that because the copper alloy sprinkler heads are exposed to an internal environment that is open to local ambient air conditions such that condensation will not occur, loss of material due to pitting and crevice corrosion is not an aging effect requiring management.

However, the applicant has committed (Commitment No. 46) to enhance the Fire Water System Program prior to entering the period of extended operation to require testing or replacement of sprinkler heads in service for 50 years. On the basis that sprinkler heads are normally open to the atmosphere and that the applicant is committing to testing or replacement of sprinkler heads in service for 50 years, the staff finds these AMR line items to be acceptable.

In Table 3.3.2-13, the LRA states that for synthetic rubber flexible connections in internal environments of fuel oil, raw water and lubricating oil, and for teflon flexible connections in internal raw water environment, there are no aging effects identified and no aging management program is required. The staff issued RAI 3.3.2.3.13-1 by letter dated July 23, 2008 to request the applicant to provide a justification why no aging effects are identified.

In its letter dated August 22, 2008, the applicant responded to RAI 3.3.2.3-13 by stating that change in material properties and cracking of elastomers, such as synthetic rubber may be due to ionizing radiation, thermal exposure, or exposure to ultraviolet radiation, or ozone. The applicant also stated that for polymers, such as Teflon, change in material properties may result from exposure to gamma radiation, but cracking is not a potential aging effect, and change in material properties is not influenced by thermal exposure or exposure to ultraviolet radiation or ozone.

The applicant stated that:

1) The lubricating oil, fuel oil, and raw water environments of the fire protection system contain no sources of ionizing radiation. Therefore, change in material properties and cracking due to ionizing radiation are not aging effects requiring management for synthetic rubber or Teflon components that are exposed to lubricating oil, fuel oil, or raw water.

2) Thermal exposure is an applicable aging mechanism for synthetic rubber components only if they are exposed for prolonged periods to a temperature greater than 95°F. Since there are no significant sources of heat within the diesel driven fire pump room, the applicant assumed that the ambient temperature will not exceed 95°F over a prolonged period. Additionally, the fire protection system is in the standby mode during normal plant operation, so there is normally no flow through the system, and the lubricating oil, fuel oil, and raw water temperatures are approximately the same as the ambient temperature. Therefore, change in material properties and cracking due to thermal exposure are not aging effects requiring management for synthetic rubber flexible connections that are exposed to lubricating oil, fuel oil, or raw water.

3) Ultraviolet radiation and ozone are applicable aging mechanisms only for natural rubber components that are exposed to sources of ultraviolet radiation and ozone. Synthetic rubbers have demonstrated excellent resistance to ultraviolet radiation and ozone. The lubricating oil, fuel oil, and raw water environments contain no sources of ultraviolet radiation and ozone. Therefore, change in material properties and cracking due to ultraviolet radiation and ozone are not aging effects requiring management for synthetic rubber flexible connections that are exposed to lubricating oil, fuel oil, or raw water.

Based on its review, the staff finds the applicant's response has satisfactorily identified stressors and thresholds for which hardening and loss of strength are aging effects for elastomer components and applied aging management for these cases. Where the stressors and thresholds for which hardening and loss of strength are not exceeded, aging management is not required. This is also confirmed by the GALL Report, Section IX.C, which defines elastomer materials and states that hardening and loss of strength of elastomers can be induced by elevated temperatures (over 95°F), and additional aging factors such as exposure to ozone, oxidation, and radiation. Therefore, the staff finds the applicant response to be acceptable.

In Table 3.3.2-13, the LRA states that for copper and copper alloy tubing and valve bodies in an air-indoor external environment, there are no aging effects identified and no aging management program is required. The applicant has referenced footnote “G”, environment not in the GALL Report for this component and material. However, the staff noted GALL Report item V.F-3 identifies copper alloy in an air-indoor uncontrolled external environment with no aging effects and no aging management program. On the basis that the GALL Report recommends no aging effects for copper alloy piping components in an air-indoor external environment, the staff finds these line items acceptable.

In its letter dated June 30, 2008, in response to RAI B.2.17-2, the applicant amended Table 3.3.2-13, Fire Protection System, to credit the Heat Exchanger Inspection Program to manage the aging effect of reduction of heat transfer due to fouling for copper alloy oil cooler tubes in a lubricating oil external environment. The applicant applied footnote “H”. The staff noted that the internal environment of these tubes is raw water and the internal surfaces are managed by the Fire Water System Program for loss of material, which includes actions to ensure no significant corrosion, MIC, or biofouling has occurred, and the Heat Exchanger Inspection Program for reduction of heat transfer. The staff reviewed the Heat Exchanger Inspection Program, which will be inspecting the inner and the external surface of the tubes to detect for fouling. The staff’s evaluation of the Heat Exchanger Inspection Program is documented in Section 3.0.3.1.12.

On the basis that the applicant is crediting the Fire Water Inspection Program to ensure no significant fouling is occurring and crediting the Heat Exchanger inspection Program to obtain direct evidence of fouling for the internal surfaces of the tubes, the staff finds that implementation of the Heat Exchanger Inspection for the external surfaces of the tubes in a lubricating oil environment will ensure that the heat transfer capabilities of the subject heat exchangers, and the pressure boundary integrity of the subject tubes, are maintained consistent with the current licensing basis during the period of extended operation.

In Table 3.3.2-13, the LRA states that for synthetic rubber flexible connections in fuel oil and raw water internal environments in the fire protection system, there are no aging effects requiring management. In RAI 3.3.2.3-1, Part A by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1 Part A, the applicant stated that the applicable aging effects for elastomers (including butyl rubber, synthetic rubber, neoprene, and silicone) are change in material properties and cracking, which may be due to ionizing radiation, thermal exposure, or exposure to ultraviolet radiation or ozone. The applicant provided the threshold level for ionizing radiation as 10E6 rads, for temperature as greater than 95^{o}F, and for ultraviolet radiation and ozone as prolonged exposure. The applicant further stated that, except for certain areas in the Reactor Building, where ionizing radiation could be more than the threshold limit, the other buildings are all in an environment that is within the threshold limits. Therefore, the applicant concluded that there are no aging effects requiring management for synthetic rubber flexible connections in fuel oil and raw water internal environments in the fire protection system.

The staff reviewed the applicant response to RAI 3.3.2.3-1, Part A, and finds the applicant response acceptable because the applicant defined the stressors that could cause the aging effects in various structures. The applicant response is consistent with the GALL Report definitions of the threshold limits of the stressors as recommended in the GALL Report Section IX. On the basis of its review, the staff finds for synthetic rubber flexible connections in a fuel oil internal environment in the diesel fuel oil system, there are no aging effects requiring management.

In Table 3.3.2-13, the LRA states that for Teflon flexible connections in raw water internal and indoor air external environments in the fire protection system, there are no aging effects requiring management. In RAI 3.3.2.3-1, Part A by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1, Part A, the applicant stated that:

> The only applicable aging effect for Teflon is change in material properties. Change in material properties of Teflon may be due to exposure to gamma radiation. Thermal exposure and exposure to ultraviolet radiation or ozone are not applicable aging mechanisms for Teflon.
>
> Gamma radiation is an applicable aging mechanism for Teflon components only if the total integrated dose (TID) is equal to or greater than 10E4 rads. The Teflon components in the Fire Protection System are located in the Circulating Water Pumphouse, an area of the plant where ionizing radiation levels are such that the TID over a 60-year period, which includes the period of extended operation, will not equal or exceed 10E3 rads. Also, there are no sources of gamma radiation expected to exist in the raw water of the Fire Protection System or the treated water environment of the Sampling System. Therefore, change in material properties and cracking due to ionizing radiation are not aging effects requiring management for these components.

The staff reviewed the applicant response and noted that these flexible connections are located in an area where the ionizing radiation is less than the threshold value of 10E6 rads. On this basis, the staff finds the applicant response acceptable and concludes that for Teflon flexible connections in raw water internal and indoor air external environments in the fire protection system, there are no aging effects requiring management.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

In Table 3.3.2-13, the LRA states that for galvanized steel piping in an outdoor external environment, there are no aging effects identified and no aging management program is required. The applicant has referenced footnote “G”, environment not in the GALL Report for this component and material.

The staff finds that as discussed in M. G. Fontana, “Corrosion Engineering, Third Edition, McGraw-Hill, 1986, this is acceptable for galvanized steel in an outdoor environment because the corrosion protection of the zinc coating is enhanced by the build-up of corrosion products deposited out of solution. The staff finds galvanized steel in an outdoor environment has no aging effects that require aging management because galvanized steel in an outdoor environment has no applicable aging effect as discussed in M. G. Fontana, “Corrosion Engineering, Third Edition, McGraw-Hill, 1986.

In Table 3.3.2-13, the LRA states that for copper alloy halon spray nozzles in an environment of ventilation, there are no aging effects identified and no aging management program is required. The applicant has referenced footnote “G”, environment not in the GALL Report for this component and material.

The staff noted that these spray nozzles are in the halon system, which is normally a dry air environment. The staff also noted that these spray nozzles are open to atmosphere. In LRA Table 3.0-1, Internal Environments, the applicant stated that internal ambient environment inside components that are open to the ambient conditions in their location are also included under ventilation environment. Since the spray nozzles are open to atmosphere and would normally be exposed to internal air environment, the staff finds that this material/ environment is similar to GALL Report item VII.I-2, for copper alloy components in an air-indoor uncontrolled environment, with no aging effects and no aging management program required. Based on this review, the staff finds that for copper alloy halon spray nozzles in an environment of ventilation, there are no aging effects identified and no aging management program is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.14 Aging Management Review Results - Fuel Pool Cooling and Cleanup System and Fuel Pool and Auxiliaries – LRA Table 3.3.2-14

The staff reviewed LRA Table 3.3.2-14, which summarizes the results of AMR evaluations for the fuel pool cooling and cleanup system and fuel pool and auxiliaries component groups.

The staff reviewed LRA Table 3.3.2-14 which summarizes the results of AMRs for fuel pool cooling screens for skimmer surge tanks which are constructed from stainless steel. The applicant proposed that this system meets the definitions given above and therefore the environment, aging effect requiring management, and AMR should be classified as not applicable. The staff agrees with this proposal because these components do not have an internal surface.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.15 Aging Management Review Results - Neutron Monitoring System – LRA Table 3.3.2-15

The staff reviewed LRA Table 3.3.2-15, which summarizes the results of AMR evaluations for the neutron monitoring system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-15 are consistent with the GALL Report.

3.3.2.3.16 Aging Management Review Results - Primary Containment Atmosphere Circulation System – LRA Table 3.3.2-16

The staff reviewed LRA Table 3.3.2-16, which summarizes the results of AMR evaluations for the primary containment atmosphere circulation system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-16 are consistent with the GALL Report.

3.3.2.3.17 Aging Management Review Results - Process and Area Radiation Monitoring System – LRA Table 3.3.2-17

The staff reviewed LRA Table 3.3.2-17, which summarizes the results of AMR evaluations for the process and area radiation monitoring system component groups.

In LRA Table 3.3.2-17, the applicant proposed to manage cracking of copper alloy for piping and piping components in the Process and Area Radiation Monitoring System exposed to an internal environment of treated water using the AMP B.2.14 "Closed Cooling Water Chemistry Program."

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, "Chemistry Program Effectiveness Inspection" will be used to supplement AMP B.2.14, "Closed Cooling Water Chemistry Program" in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant's AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

LRA Table 3.3.2-17 summarizes the results of AMRs for process and area radiation monitoring system piping and piping components constructed using copper alloy exposed to indoor air (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for the component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination, and that no AMP is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.18 Aging Management Review Results - Radwaste Liquid System – LRA Table 3.3.2-18

The staff reviewed LRA Table 3.3.2-18, which summarizes the results of AMR evaluations for the radwaste liquid system component groups.

In LRA Table 3.3.2-18, the applicant proposed to manage loss of material due to selective leaching for cast iron for piping and piping components exposed to an internal environment of raw water using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching 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's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. The staff noted that the GALL Report recommends the use of the Selective Leaching Program for the same combination of material/environment/aging effect in items VII.C1-11 for a different system. On the basis that the applicant will be performing a combination of a visual inspection and hardness test for these components and these AMR material/environment/aging effect combination is consistent with the GALL AMR Item VII.C1-11 for cast iron, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-18, the applicant proposed to manage loss of material in piping and piping components, and cleanouts and pump casings in an internal environment of raw water by using the Monitoring and Collection System Inspection Program. The applicant referenced footnote G for this line item indicating that environment is not in the GALL Report for this component and material combination. The applicant also referenced footnote 0356, which indicates that uncontrolled drainage in the radwaste liquids system is considered to be a raw water environment.

The staff noted that these components are in scope for a structural integrity function only to ensure that its failure does not impact other safety-related system and components. The staff reviewed the Monitoring and Collection System Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff's evaluation of the Monitoring and Collection System Inspection Program is documented in SER Section 3.0.3.1.15. Because the Monitoring and Collection System Inspection is performed at susceptible locations, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Monitoring and Collection System Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.19 Aging Management Review Results - Radwaste Solids Handling System – LRA Table 3.3.2-19

The staff reviewed LRA Table 3.3.2-19, which summarizes the results of AMR evaluations for the radwaste solids handling system component groups.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of material due for carbon steel, stianless steel and copper alloy material for piping and piping components and tanks exposed to an internal environment of raw water using the AMP B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” 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's evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting loss of material and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” 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's evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting cracking and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction (e.g., leakage) with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of material due to selective leaching for copper alloy for piping and piping components exposed to an internal environment of raw water using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching 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's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. The staff noted that the GALL Report recommends the use of the Selective Leaching Program for the same combination of material/environment/aging effect in items VII.C1-10 for a different system. On the basis that the applicant will be performing a combination of a visual inspection and hardness test for these components and these AMR material/environment/aging effect combination is consistent with the GALL AMR Item VII.C1-10 for copper alloy, the staff finds the AMR results for this line item acceptable.

LRA Table 3.3.2-19 summarizes the results of AMRs for the Radwaste Solids Handling System piping and piping components constructed from copper alloy and exposed to indoor air (external) and the applicant proposed that this material-environment combination has no aging effects requiring management and no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in the GALL Report for this component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination and that no AMP is required. Copper alloys in an air-indoor internal environment have 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 (which is more severe than indoor air) as cited in Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987).

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.20 Aging Management Review Results - Raw Water Treatment System – LRA Table 3.3.2-20

The staff reviewed LRA Table 3.3.2-20, which summarizes the results of AMR evaluations for the raw water treatment system component groups.

In LRA Table 3.3.2-20, the applicant proposed to manage loss of material due to selective leaching for cast iron and copper alloy material for valve bodies exposed to an external environment of outdoor air using the AMP B.2.29 “Selective Leaching Inspection.”

The AMR line items credit the AMP B.2.29 “Selective Leaching Inspection” to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff’s evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.21 Aging Management Review Results - Reactor Building Chilled Water System – LRA Table 3.3.2-21

The staff reviewed LRA Table 3.3.2-21, which summarizes the results of AMR evaluations for the reactor building chilled water system component groups.

In LRA Table 3.3.2-21, the applicant proposed to manage cracking of copper alloy for piping and piping components in the Reactor Building Chilled Water System exposed to an internal environment of treated water using the AMP B.2.14 “Closed Cooling Water Chemistry Program.”

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, “Chemistry Program Effectiveness Inspection” will be used to supplement AMP B.2.14, “Closed Cooling Water Chemistry Program” in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant’s AMP B.2.14 “Closed Cooling Water Chemistry Program” and AMP B.2.22 “Chemistry Program Effectiveness Inspection” and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

In LRA Table 3.3.2-21, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” to manage loss of material for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff’s evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by an qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting cracking and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-21, the applicant proposed to manage loss of material due to selective leaching for cast iron and copper alloy material for chillers, piping and piping components and elements exposed to an external environment of indoor air using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.22 Aging Management Review Results - Reactor Building Closed Cooling Water System – LRA Table 3.3.2-22

The staff reviewed LRA Table 3.3.2-22, which summarizes the results of AMR evaluations for the reactor building closed cooling water system component groups.

In LRA Table 3.3.2-22, the applicant proposed to manage cracking of copper alloy for piping and piping components in the Reactor Building Closed Cooling Water System exposed to an internal environment of treated water using the AMP B.2.14 "Closed Cooling Water Chemistry Program."

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The staff noted that on LRA page 3.3-289 in LRA Table 3.3.2-22, the applicant referenced a NUREG-1801 Volume 2 item and then cited a note H, which indicates that this aging effect is not in NUREG-1801 for this component, material and environment combination. It was unclear to the staff why the applicant referenced a GALL line item and cited a note H, therefore by letter dated July 23, 2008 the staff issued RAI 3.3.2-4, requesting the applicant to clarify the applicability of this GALL item to the LRA Table 2 item. By letter dated August 22, 2008 the applicant responded to RAI 3.3.2-4, in which the applicant stated this was an error in the LRA and that based upon their review, this was the only instance in which copper alloy subject to cracking in a treated water environment referenced a GALL item. The staff confirmed the applicant amended the LRA to remove the reference to the GALL line item and replaced it with "N/A". On the basis of its review, the staff finds the applicant's response acceptable because the LRA was amended and the error was corrected.

During its review, it was unclear to the staff whether SSES would be supplementing the Closed Cooling Water Chemistry Program with a one-time inspection, either the Chemistry Effectiveness Program or Heat Exchanger Inspection Program. Therefore by letter dated August 12, 2008 the staff issued RAI B.2.14-2 requesting the applicant to clarify whether an appropriate one-time inspection will supplement the Closed Cooling Water Chemistry Program whenever credited and to identify which one-time inspection would be used.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, "Chemistry Program Effectiveness Inspection" will be used to supplement B.2.14, "Closed Cooling Water Chemistry Program" in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant's AMP B.2.14 "Closed Cooling Water Chemistry Program" and AMP B.2.22 "Chemistry Program Effectiveness Inspection" and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

LRA Table 3.3.2-22 summarizes the results of AMRs for reactor building closed cooling water, system piping and piping components constructed using copper alloy exposed to indoor air (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for the component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination, and that no AMP is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.23 Aging Management Review Results - Reactor Building HVAC System – LRA Table 3.3.2-23

The staff reviewed LRA Table 3.3.2-23, which summarizes the results of AMR evaluations for the reactor building HVAC system component groups.

In Table 3.3.2-23, the LRA states that for glass sight gauges in the reactor building HVAC system exposed to Freon environment, there are no aging effects identified and no aging management program is required. The staff was concerned, however, that the Freon environment for the glass sight gauges in the reactor building HVAC system might create sufficiently cold environments for the glass material that could, at a minimum impact the fracture toughness of the material. Hence, the staff was concerned that the Freon environment might impact the tolerance of the glass material to withstand an existing crack in the glass material used to fabricate the components (i.e., reduce the flaw tolerance of the material). In RAI 3.3.2.3-2 by letter dated July 23, 2008, the staff asked the applicant to justify why reduction of fracture toughness and cracking would not be applicable aging effects requiring management for the surfaces of glass sight gauges in the reactor building HVAC system under internal exposure to an air – gas (Freon) environment.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-2, the applicant stated:

> The only relevant conditions that could result in aging degradation (such as cracking) of glass, as identified by industry operating experience, and by research conducted by the Electric Power Research Institute, are exposure to high-temperature water, and/or exposure to hydrofluoric acid or caustic alkalis. High-temperature water, hydrofluoric acid, and caustic alkalis are not expected to exist in the air-gas (Freon) environment of the Reactor Building HVAC System.
>
> Exposure to low temperature has not been identified as a relevant condition that could result in aging degradation of glass. Also, reduction in fracture toughness has not been identified as an applicable aging effect for glass, which is by definition a brittle material when subject to impact.
>
> Additionally, the coldest part of the refrigeration cycle, expansion, is typically in the range of approximately 30'F to 40'F, which is not exceptionally cold. The subject glass sight gauges, however, are located between the components of compression and expansion cycles, where the temperature is typically in the range of approximately 95°F to 110°F.

The staff reviewed the applicant response and noted that the coldest temperature the glass material would experience during normal operation is between 30^{o}F to 40^{o}F, which are not very cold temperatures and at those temperatures the glass material will be resistant to cracking. Based on the operating conditions, and also the location of the sight glasses between components of compression and expansion cycles, the staff finds that the glass material in a Freon environment will not experience any aging effects requiring management.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

LRA Table 3.3.2-23 summarizes the AMR results for the emergency switchgear (SWGR) and load center rooms cooling coils constructed from copper exposed to ventilation (internal) and the applicant proposed that this material-environment combination has no aging effects requiring management and no AMR is required.

The applicant has indicated that generic note I is applicable for these items. Generic note I is “Aging effect in NUREG-1801 for this component, material, and environment is not applicable.” The staff agrees that there will not be an aging mechanism for this material/environment combination. 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 (which is more severe or ventilation) as cited in Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987).

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).

LRA Table 3.3.2-23 summarizes the AMR results for reactor building HVAC system valve bodies made from copper alloy (bronze and brass) and tubing made from copper and exposed to indoor air (external), sight gauges made from glass exposed to air-gas (Freon) (internal), piping and cooling units, emergency SWGR and load center room DX type cooling coils made from copper and exposed to indoor air (external), and cooling units, emergency SWGR and load center rooms cooling coils made from copper alloy (copper-nickel) exposed to ventilation (external). The applicant proposed that this material-environment combination has no aging effects requiring management and no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is “Environment not in NUREG-1801 for this component and material.” The staff confirmed that this environment is not in GALL for this component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination and that no AMP is required. Copper alloy 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 (which is more severe than indoor air) as cited in Metals Handbook, Volume 13, "Corrosion" (American Society for Metals International, 1987). This conclusion is also based on the fact that there have been no aging effects observed for glass components in this air environment. Ref: Handbook of Glass Properties, N. P. Bansal and R. H. Doremua, Academic Press 1986, pg. 646.

The staff reviewed LRA Table 3.3.2-23 which summarizes the results of AMRs for the Reactor Building HVAC System, unit coolers, CSP pump room RHR pump room, RCIC pump room, and HPCI pump room tube plugs constructed from stainless steel, and unit coolers, CSP pump room, RHR pump room, RCIC pump room, and HPCI pump room fins constructed from copper, and condenser water cooled tube plugs constructed from copper alloy (copper-nickel). The applicant proposed that this system meets the definitions given above and therefore the environment, aging effect requiring management, and AMR should be classified as not applicable. The staff agrees with this proposal because these components do not have an internal surface because they are solid and therefore, there will not be an aging effect requiring an AMP.

In LRA Table 3.3.2-23, the applicant proposed to manage reduction of heat transfer of copper cooling unit fins in an external environment of ventilation by using the Cooling Units Inspection Program. The applicant referenced footnote “H” for this line item indicating that aging effect is not in the GALL Report for this component, material and environment combination.

The staff noted the Cooling Unit Inspection Program will detect and charaterize the condition of cooling unit components that are exposed to a ventilation environment, and provides direct evidence as to whether, and to what extent, reduction of heat transfer has occurred, or is likely to occur that could result in a loss of intended function. In its letter dated July 25, 2008, the applicant responded to RAI B.2.23-2 stating that visual inspection (VT-3 or equivalent) techniques will be used to determine whether reduction in heat transfer is occurring. The applicant also stated that the specific inspection technique will be determined prior to the inspection activities and will be consistent with the recommendations in GALL AMP XI.M32. The staff’s evaluation of the Cooling Units Inspection Program is documented in SER Section 3.0.3.1.11. Because the Cooling Units Inspection Program performs visual inspection to determine if any fouling has occurred that could cause reduction of heat transfer, and on the basis that the visual inspection technique will be consistent with the recommendation in GALL AMP XI.M32, the staff finds the Cooling Units Inspection Program will adequately manage the aging effect of reduction of heat transfer in cooling unit components exposed to a ventilation environment.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.24 Aging Management Review Results - Reactor Nonnuclear Instrumentation System – LRA Table 3.3.2-24

The staff reviewed LRA Table 3.3.2-24, which summarizes the results of AMR evaluations for the reactor nonnuclear instrumentation system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-24 are consistent with the GALL Report.

3.3.2.3.25 Aging Management Review Results - Reactor Water Cleanup System – LRA Table 3.3.2-25

The staff reviewed LRA Table 3.3.2-25, which summarizes the results of AMR evaluations for the reactor water cleanup system component groups.

In LRA Tables 3.2.2-25 the applicant proposed to manage cracking in copper alloy piping and piping components in an environment of treated water by using the BWR Water Chemistry Program, alone. The applicant cited generic note H for these AMR results, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. In a letter dated July 15, 2008, the staff issued RAI 3.2-3, applicable for these AMR results and for similar AMR results in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, and 3.4.2 3. The RAI asked the applicant to provide a technical justification as to why an inspection program, such as the Chemistry Program Effectiveness Inspection is not needed to confirm that the BWR Water Chemistry Program is effective in preventing the aging effect.

In a letter dated August 15, 2008, the applicant responded to RAI 3.3-3 by providing the following response:

For the five AMR results lines listed in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3, where the material is copper alloy, the environment is treated water (internal), and the aging effect is cracking, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of this program in managing the effects of aging, including cracking in susceptible materials.

LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3 are revised to reflect these results.

The staff reviewed the applicant's response and the associated LRA changes. The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking due to stress corrosion cracking. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and uses examination techniques that are capable of detecting cracking, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection of the aging effect if it should occur, the staff finds the applicant's proposed AMPs for managing the potential aging effect of cracking due to stress corrosion cracking in copper alloy piping and piping components exposed to treated water in the reactor water cleanup system to be acceptable. On this basis, the staff finds that the issue in RAI 3.2 3 is resolved by the applicant's LRA changes.

In LRA Table 3.3.2-25, the applicant applied note "H" for carbon steel piping and valve bodies exposed to an internal environment of treated water in the reactor water cleanup system. The applicant proposed to manage loss of material due to flow-accelerated corrosion by using the Flow-Accelerated Corrosion Program. The definition of footnote "H" implies that these line items are not consistent with GALL Report. However, the applicant has identified GALL Report item VII.E3-18, which is for loss of material due to general, pitting and crevice corrosion. Furthermore, footnote "H" states that aging effect is not in the GALL Report for this component, material and environment combination. Yet in the same table, the LRA has another line item for the same component, material and environment combination with an aging effect of loss of material due to flow-accelerated corrosion where the LRA has referenced footnote "A" and correctly identified GALL Report item VIII.D2-8.

Since the GALL Report addresses the aging effect of loss of material due to flow-accelerated corrosion for this component, material and environment combination, the staff issued RAI 3.3.2.3.25-1 by letter dated July 9, 2008 requesting the applicant to justify why footnote "H" was identified in these two line items and footnote "A" in other line item in the same system. The staff also asked the applicant to justify why a GALL Report item number was referenced with footnote "H".

In its letter dated August 8, 2008, the applicant responded to RAI 3.3.2.3.25-1 by stating that there is no line item in GALL Chapter VII, Section E3, Reactor Water Cleanup System, for loss of material due to flow-accelerated corrosion and therefore, comparison to Chapter VII should not have been made. The applicant further stated that similar to other line items in Table 3.3.2-

25 for which the FAC program was credited, comparison should have been made to GALL item VIII.D2-8. The applicant revised the subject line item to refer to GALL item VIII.D2-8 and Table 3.4.1, item 3.4.1-29, which is applicable to FAC. The applicant changed footnote H to footnote A and the line item is consistent with the GALL Report.

The staff reviewed the changes and compared them with GALL item VIII.D2-8, and noted that the material, environment, aging effect and recommended AMP are the same as in the GALL Report. On this basis, the staff finds the applicant response acceptable.

LRA Table 3.3.2-25 summarizes the results of AMRs for reactor water cleanup system piping and piping components constructed using copper alloy exposed to indoor air (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is “Environment not in NUREG-1801 for this component and material.” The staff confirmed that this environment is not in GALL for the component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination, and that no AMP is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.26 Aging Management Review Results - RHR Service Water System – LRA Table 3.3.2-26

The staff reviewed LRA Table 3.3.2-26, which summarizes the results of AMR evaluations for the RHR service water system component groups.

In LRA Table 3.3.2-26, the applicant proposed to manage loss of material for stainless steel material for piping and piping components exposed to an external environment of outdoor air using the AMP B.2.32 “System Walkdown Program.”

The AMR line item credits the AMP B.2.32 “System Walkdown 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’s evaluation of the AMP B.2.32 “System Walkdown Program” is documented in SER Section 3.0.3.2.15. The staff determined that this program is a condition monitoring program that will detect the aging effect of loss of material for metals, including stainless steel, by periodic surveillance activities and observations of components’ external surfaces to detect aging degradation that are with in the scope of license renewal. The staff also determined that these activities are adequate to manage loss of material for stainless steel piping and piping components exposed to air-outdoor. On the basis that the applicant will be performing periodic visual inspections of these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-26, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 “Area-Based NSAS Inspection.”

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” to manage loss of material for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff’s evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting cracking and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-26, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components and elements exposed to an external environment of indoor air using the AMP B.2.29 “Selective Leaching Inspection.”

The AMR line items credit the AMP B.2.29 “Selective Leaching Inspection” to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff’s evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item

In LRA Table 3.3.2-26, the applicant proposed to manage loss of material of carbon steel piping in an internal environment of ventilation by using the Supplementary Piping/Tank Inspection Program. The applicant referenced footnote “G” for this line item indicating that environment is not in the GALL Report for this component and material combination. The environment is an aggressive environment of air-water interface.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank

Inspection is performed at very specific locations of air/water interface, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.27 Aging Management Review Results - Sampling System – LRA Table 3.3.2-27

The staff reviewed LRA Table 3.3.2-27, which summarizes the results of AMR evaluations for the sampling system component groups.

In LRA Table 3.3.2-27, the applicant proposed to manage cracking of copper alloy for piping and piping components and chiller components (condenser channel header, evaporator shell and integral piping/tubing) in the Sampling System exposed to an internal environment of treated water using the AMP B.2.14 “Closed Cooling Water Chemistry Program.”

The AMR line item credits the Closed Cooling Water Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines.

The applicant responded to RAI B.2.14-2, in a letter dated August 12, 2008. The applicant clarified that the one-time inspection performed as part of the AMP B.2.22, “Chemistry Program Effectiveness Inspection” will be used to supplement AMP B.2.14, “Closed Cooling Water Chemistry Program” in all instances where AMP B.2.14 is credited for aging management in LRA Table-2 items, with the exception of the Diesel Jacket Water Cooling System. The staff reviewed the applicant’s AMP B.2.14 “Closed Cooling Water Chemistry Program” and AMP B.2.22 “Chemistry Program Effectiveness Inspection” and its evaluations are documented in SER Section 3.0.3.2.7 and 3.0.3.1.10, respectively. 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 cracking for copper and copper alloy components exposed to a treated water environment. The staff further noted the Closed Cooling Water Chemistry Program is an existing SSES program that properly monitors components and controls corrosion inhibitor concentrations for components, within the scope of license renewal, consistent with relevant EPRI water chemistry guidelines. The staff confirmed that the Chemistry Program Effectiveness Inspection will be used to verify the effectiveness of the applicant's Closed Cooling Water Chemistry Program to manage cracking and that a combination of appropriate volumetric and visual examination techniques (such as VT-1 or VT-3) will be performed by qualified personnel on a sample population of most susceptible subject components. On this basis, the staff finds that these AMR results will be adequately managed by these programs.

In LRA Table 3.3.2-27, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for chiller components (channel/header, integral piping/tubing and evaporator shell) exposed to an external environment of indoor air using the AMP B.2.29 “Selective Leaching Inspection.”

The AMR line items credit the AMP B.2.29 “Selective Leaching Inspection” to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff’s evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item

In Table 3.3.2-27, the LRA states that for Teflon piping and piping components in treated water internal environment in the sampling system, there are no aging effects requiring management. In RAI 3.3.2.3-1, part A by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1, Part A, the applicant stated that:

> The only applicable aging effect for Teflon is change in material properties. Change in material properties of Teflon may be due to exposure to gamma radiation. Thermal exposure and exposure to ultraviolet radiation or ozone are not applicable aging mechanisms for Teflon.
>
> Gamma radiation is an applicable aging mechanism for Teflon components only if the total integrated dose (TID) is equal to or greater than 10E4 rads. The Teflon components in the Fire Protection System are located in the Circulating Water Pumphouse, an area of the plant where ionizing radiation levels are such that the TID over a 60-year period, which includes the period of extended operation, will not equal or exceed 10E3 rads. Also, there are no sources of gamma radiation expected to exist in the raw water of the Fire Protection System or the treated water environment of the Sampling System. Therefore, change to the material properties and cracking due to ionizing radiation are not
> aging effects requiring management for these components.

The staff reviewed the applicant response and noted that these piping and piping components are located in an area where the ionizing radiation is less than the threshold value of 10E6 rads. On this basis, the staff finds the applicant response acceptable and concludes that for Teflon piping and piping components in treated water internal environment in the sampling system, there are no aging effects requiring management.

In Table 3.3.2-27, the applicant stated that Teflon piping and piping components in an indoor air external environment has an aging effect of change in material properties and has credited the System Walkdown Program to manage this aging effect. In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1, the applicant stated that these Teflon piping and piping components are located in areas of the Reactor Building where these components could be exposed to ionizing radiation greater than 10E6 rads and to temperatures greater than 95^{o}F. Therefore, the applicant has identified the aging effect of change in material properties.

In RAI B.2.32-4, the staff asked the applicant to justify its basis for crediting the System Walkdown Program to manage cracking and changes in material properties that may occur in the internal surfaces of in-scope components that are fabricated from non-metallic material. In its letter dated August 12, 2008, in response to RAI B.2.32-4, the applicant revised the LRA to include additional enhancements to address the management of changes in material properties of elastomer and polymer materials. The staff's acceptance of the System Walkdown Program to manage this aging effect and its discussion of RAI B.2.32-4 are documented in SER Section 3.0.3.2.14. The staff determined the applicant will supplement a visual inspection performed during periodic system walkdowns with a supplemental physical manipulation and/or prodding to inspect elastomer and polymer components. The staff noted that the physical manipulation will aid the visual inspection in detecting age-related degradation because changes in material properties and cracking can be detected during manipulation of elastomeric and polymeric components by the relative inflexibility of the component, or by the failure of the component to return to its previous shape or configuration. Based on this review, the staff concludes that the System Walkdown Program will adequately manage the aging effect of change in material properties of Teflon piping and piping components during the period of extended operation.

LRA Table 3.3.2-27 summarizes the results of AMRs for sampling system piping and piping components constructed using copper alloy exposed to indoor air (external). The applicant proposed that there is no aging effect for the material environment combination and that no AMR is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for the component and material. The staff also agrees that there will not be an aging mechanism for this material/environment combination, and that no AMP is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.28 Aging Management Review Results - Sanitary Drainage System – LRA Table 3.3.2-28

The staff reviewed LRA Table 3.3.2-28, which summarizes the results of AMR evaluations for the sanitary drainage system component groups.

In LRA Table 3.3.2-28, the applicant proposed to manage loss of material due for cast iron and carbon steel material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 "Area-Based NSAS Inspection."

The AMR line items credit the AMP B.2.46 “Area-Based NSAS Inspection” 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’s evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting loss of material and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-28, the applicant proposed to manage loss of material due to selective leaching for cast iron for piping and piping components exposed to an internal environment of raw water using the AMP B.2.29 “Selective Leaching Inspection.”

The AMR line items credit the AMP B.2.29 “Selective Leaching Inspection” to manage loss of material due to selective leaching 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’s evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. The staff noted that the GALL Report recommends the use of the Selective Leaching Program for the same combination of material/environment/aging effect in items VII.C1-11 for a different system. On the basis that the applicant will be performing a combination of a visual inspection and hardness test for these components and these AMR material/environment/aging effect combination is consistent with the GALL AMR Item VII.C1-11 for cast iron, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.29 Aging Management Review Results - Service Air System – LRA Table 3.3.2-29

The staff reviewed LRA Table 3.3.2-29, which summarizes the results of AMR evaluations for the service air system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-29 are consistent with the GALL Report.

3.3.2.3.30 Aging Management Review Results - Service Water System – LRA Table 3.3.2-30

The staff reviewed LRA Table 3.3.2-30, which summarizes the results of AMR evaluations for the service water system component groups.

In LRA Table 3.3.2-30, the applicant proposed to manage cracking for copper alloy material for piping and piping components exposed to an internal environment of raw water using the AMP B.2.46 "Area-Based NSAS Inspection."

The AMR line items credit the AMP B.2.46 "Area-Based NSAS Inspection" to manage loss of material for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.46 is documented in SER Section 3.0.3.3.1. The staff noted that this program is a plant-specific program that performs an appropriate combination of established volumetric and visual inspection techniques (nondestructive examination techniques) that will be performed by a qualified personnel on a sample population of those components in scope of this program. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such degradation that progresses slowly and have long incubation times will have time to become apparent. The staff determined the inspection techniques will be capable of detecting cracking and the applicant will initiate corrective actions if an unacceptable loss of material or wall thinning has occurred that may have a spatial interaction with safety-related components, as determined by engineering evaluation. On the basis that the applicant will be performing an appropriate combination of a visual inspection and volumetric testing for these components, the staff finds the AMR results for this line item acceptable.

In LRA Table 3.3.2-30, the applicant proposed to manage loss of material due to selective leaching for copper alloy material for piping and piping components exposed to an external environment of indoor air using the AMP B.2.29 "Selective Leaching Inspection."

The AMR line items credit the AMP B.2.29 "Selective Leaching Inspection" to manage loss of material due to selective leaching for these components. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in the Gall Report for this component, material and environment combination. The staff's evaluation of the AMP B.2.29 is documented in SER Section 3.0.3.2.17. The staff noted that this program is a one-time inspection that will perform a combination of visual inspection and hardness testing to determine if loss of material due to selective leaching has occurred. The staff further noted that the applicant will perform the inspections of the components with in the scope of this program at least 10 years prior to entering the period of extended operation such that the condition of the material is more representative of the conditions during the period of extended operation. The staff determined the applicants proposed inspection techniques to detect loss of material due to selective leaching are consistent with the inspection techniques recommended in GALL AMP XI.M33 and the applicant will initiate corrective actions based on the evaluation of the results of these inspections. On the basis that the applicant will be performing a combination of a visual inspection and hardness test, which is consistent with the with the recommendations in GALL AMP XI.M33, for these components, the staff finds the AMR results for this line item

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.31 Aging Management Review Results - Standby Liquid Control System – LRA Table 3.3.2-31

The staff reviewed LRA Table 3.3.2-31, which summarizes the results of AMR evaluations for the SLC system component groups.

In LRA Table 3.3.2-31, the applicant proposed to manage loss of material of stainless steel tanks in an internal environment of ventilation by using the Supplementary Piping/Tank Inspection Program. The applicant referenced footnote “J” for this line item indicating that neither the component nor the material and environment combination is evaluated in the GALL Report. The applicant also references footnote 0338, indicating loss of material is due to crevice and/or pitting corrosion at the air/water interface within the SLC Storage Tank.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations of air/water interface, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

In Table 3.3.2-31, the LRA states that for butyl rubber accumulators that are exposed internally to a nitrogen air gas environment and externally to treated water, there are no aging effects requiring management. In RAI 3.3.2.3-1, Part A by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations.

In its letter dated August 27, 2008, in response to RAI 3.3.2.3-1 part A, the applicant stated that the applicable aging effects for elastomers (including butyl rubber, synthetic rubber, neoprene, and silicone) are change in material properties and cracking, which may be due to ionizing radiation, thermal exposure, or exposure to ultraviolet radiation or ozone. The applicant provided the threshold level for ionizing radiation as 10E6 rads, for temperature as greater than 95^{o}F, and for ultraviolet radiation and ozone as prolonged exposure. The applicant further stated that, except for certain areas in the Reactor Building, where ionizing radiation could be more than the threshold limit, the other buildings are all in an environment that is within the threshold limits. Therefore, the applicant concluded that there are no aging effects requiring management for butyl rubber accumulators that are exposed internally to a nitrogen air gas environment and externally to treated water in the standby liquid control system.

The staff reviewed the applicant response to RAI 3.3.2.3-1, part A, and finds the applicant response acceptable because the applicant defined the stressors that could cause the aging effects in various structures. The applicant response is consistent with the GALL Report definitions of the threshold limits of the stressors as recommended in the GALL Report Section IX. On the basis of its review, the staff finds for butyl rubber accumulators that are exposed internally to a nitrogen air gas environment and externally to treated water in the standby liquid control system, there are no aging effects requiring management.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.32 Aging Management Review Results - Turbine Building Closed Cooling Water System – LRA Table 3.3.2-32

The staff reviewed LRA Table 3.3.2-32, which summarizes the results of AMR evaluations for the turbine building closed cooling water system component groups.

The staff reviewed LRA Table 3.3.2-32, which summarizes the results of AMR evaluations for the turbine building closed cooling water system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-32 are consistent with the GALL Report.

3.3.2.3.33 Aging Management Review Results - Reactor Recirculation System (NSAS Portions) – LRA Table 3.3.2-33

The staff reviewed LRA Table 3.3.2-33, which summarizes the results of AMR evaluations for the reactor recirculation system (NSAS) component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-33 are consistent with the GALL Report.

3.3.2.3.34 Aging Management Review Results - Reactor Vessel and Auxiliaries System (NSAS Portions) – LRA Table 3.3.2-34

The staff reviewed LRA Table 3.3.2-34, which summarizes the results of AMR evaluations for the RV and auxiliaries system (NSAS portions) component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-33 are consistent with the GALL Report.

3.3.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4 Aging Management of Steam and Power Conversion Systems

This section of the SER documents the staff's review of the applicant's AMR results for the steam and power conversion systems components and component groups of:

- Auxiliary Boiler System

- Bypass Steam System
- Condensate Transfer and Storage System
- Condenser and Air Removal System
- Feedwater System
- Main Steam System
- Main Turbine System
- Makeup Demineralizer System
- Makeup Transfer and Storage System
- Refueling Water Transfer and Storage System

3.4.1 Summary of Technical Information in the Application

LRA Section 3.4 provides AMR results for the steam and power conversion systems components and component groups. LRA Table 3.4.1, "Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of the GALL Report," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the steam and power conversion systems components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry OE in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry OE included a review of the GALL Report and OE issues identified since the issuance of the GALL Report.

3.4.2 Staff Evaluation

The staff reviewed LRA Section 3.4 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the steam and power conversion systems components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.4.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.4.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.4.2.2.

The staff also conducted a technical review of the remaining AMRs not consistent with or not addressed in the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.4.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.4-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.4 and addressed in the GALL Report.

Table 3.4-1 Staff Evaluation for Steam and Power Conversion Systems Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	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	Yes	Not applicable	Not applicable. The applicant addresses these components under GALL Report item number 3.4.1-4. (See SER Section 3.4.2.2.2.1)
Steel heat exchanger components exposed to treated water (3.4.1-3)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to BWRs (See SER Section 3.4.2.2.2.1)
Steel piping, piping components, and piping elements exposed to treated water (3.4.1-4)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.4.2.2.2.1)
Steel heat exchanger components exposed to treated water (3.4.1-5)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not Applicable. There are no steel heat exchanger components in-scope for license renewal in the steam and power conversion system. (See SER Section 3.4.2.2.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel and stainless steel tanks exposed to treated water (3.4.1-6)	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.4.2.2.2.1, and SER Section 3.4.2.2.7.1)
Steel piping, piping components, and piping elements exposed to lubricating oil (3.4.1-7)	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not applicable (See SER Section 3.4.2.2.2.2)
Steel piping, piping components, and piping elements exposed to raw water (3.4.1-8)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Plant-specific	Yes	Not applicable	Not applicable (See SER Section 3.4.2.2.3)
Stainless steel and copper alloy heat exchanger tubes exposed to treated water (3.4.1-9)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not Applicable (See SER Section 3.4.2.2.4.1)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.4.1-10)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not applicable (See SER Section 3.4.2.2.4.2)
Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil (3.4.1-11)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Not applicable	Not applicable (See SER section 3.4.2.2.5.1)
Steel heat exchanger components exposed to lubricating oil (3.4.1-12)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not Applicable (See SER Section 3.4.2.2.5.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, piping elements exposed to steam (3.4.1-13)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.4.2.2.6)
Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water > 60°C (> 140°F) (3.4.1-14)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable. The applicant addresses these components under GALL Report item number 3.4.1-13. (See SER Section 3.4.2.2.6)
Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water (3.4.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with the GALL Report (See SER Section 3.4.2.2.7.1)
Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water (3.4.1-16)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection (B.2.22)	Consistent with GALL Report (See SER Section 3.4.2.2.7.1)
Stainless steel piping, piping components, and piping elements exposed to soil (3.4.1-17)	Loss of material due to pitting and crevice corrosion	Plant-specific	Yes	Buried Piping and Tanks Inspection Program	See SER Section 3.4.2.2.7.2
Copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.4.1-18)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not applicable (See SER Section 3.4.2.2.7.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil (3.4.1-19)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not applicable (See SER Section 3.4.2.2.8)
Steel tanks exposed to air - outdoor (external) (3.4.1-20)	Loss of material, general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	System Walkdown Program (B.2.32) and Condensate and Refueling Water Storage Tank Inspection (B.2.19)	Consistent with GALL Report
High-strength steel closure bolting exposed to air with steam or water leakage (3.4.1-21)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Steel bolting and closure bolting exposed to air with steam or water leakage, air - outdoor (external), or air - indoor uncontrolled (external); (3.4.1-22)	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water > 60°C (> 140°F) (3.4.1-23)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	BWR Water Chemistry Program (B.2.2) and Chemistry Program Effectiveness Inspection Program (B.2.22)	Evaluated in line item 3.4.1-13 (See SER Section 3.4.2.1.1)
Steel heat exchanger components exposed to closed cycle cooling water (3.4.1-24)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.4.1-25)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water (3.4.1-26)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.4.1-27)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Steel external surfaces exposed to air - indoor uncontrolled (external), condensation (external), or air outdoor (external) (3.4.1-28)	Loss of material due to general corrosion	External Surfaces Monitoring	No	System Walkdown Program (B.2.32), and Supplementary Piping/Tank Inspection (B.2.28)	Consistent with GALL Report (See SER Section 3.4.2.1.2)
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-29)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Flow-Accelerated Corrosion (B.2.11), and Preventive Maintenance Activities – Main Turbine (B.2.49)	Consistent with GALL Report (See SER Section 3.4.2.1.3)
Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal) (3.4.1-30)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Supplemental Piping and Tanks Inspection Program (B.2.28)	Consistent with GALL Report (See SER Section 3.4.2.1.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel heat exchanger components exposed to raw water (3.4.1-31)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable (See SER Section 3.4.2.1.1)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.4.1-32)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (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	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water (3.4.1-34)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Copper alloy > 15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water, or treated water (3.4.1-35)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching Inspection Program (B.2.29)	Consistent with GALL Report
Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water (3.4.1-36)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam (3.4.1-37)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	BWR Water Chemistry Program (B.2.2)	Consistent with GALL Report (See SER Section 3.4.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel bolting and external surfaces exposed to air with borated water leakage (3.4.1-38)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Not applicable	Not applicable to BWRs
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-39)	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable	Not applicable to BWRs
Glass piping elements exposed to air, lubricating oil, raw water, and treated water (3.4.1-40)	None	None	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.4.1-41)	None	None	No	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.4.1-42)	None	None	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.4.1-43)	None	None	No	Not applicable	Not applicable to SSES (See SER Section 3.4.2.1.1)
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.4.1-44)	None	None	No	None	Consistent with GALL Report

The staff's review of the steam and power conversion systems component groups followed any one of several approaches. One approach, documented in SER Section 3.4.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.4.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.4.2.3, reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the steam and power conversion systems components is documented in SER Section 3.0.3.

3.4.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.4.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the steam and power conversion systems components:

- BWR Water Chemistry Program
- Flow-Accelerated Corrosion (FAC) Program
- Bolting Integrity Program
- Condensate and Refueling Water Storage Tanks Inspection
- Chemistry Program Effectiveness Inspection
- Supplemental Piping/Tank Inspection
- Selective Leaching Inspection
- Buried Piping and Tanks Inspection Program
- System Walkdown Program

LRA Tables 3.4.2-1 through 3.4.2-10 summarizes AMRs for the steam and power conversion systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the engineered safety features ESF components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.2.1, the applicant's references to the GALL Report are acceptable and no further staff review is required, with the exception of the following AMRs that the applicant had identified were consistent with the AMRs of the GALL Report and for which the staff felt were in need of additional clarification and assessment. The staff's evaluations of these AMRs are providing in the subsections that follows.

3.4.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.4.1, item 23, the applicant states for this line item cracking of stainless steel piping, piping components, and piping elements is addressed under the treated water environment in table item 3.4.1-23. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that the components under the this commodity group: stainless steel piping, piping components, and piping elements, are evaluated as exposed to uncontrolled air under line item 3.4.1-23. On the basis that this commodity group has been evaluated, the staff agreed with the applicant's treatment of this line item.

In LRA Table 3.4.1, items 24 and 25, the applicant states that there are no steel heat exchanger components and stainless steel components that are subject to AMR and exposed to treated (closed cycle cooling) water in the steam and power conversion system for SSES. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that no components under this commodity group exist in the Steam and Power Conversion System. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result lines in the GALL Report is not applicable to SSES.

In LRA Table 3.4.1, items 27 and 28, the applicant states that there are no cooper alloy components and heat exchanger tubes exposed to closed cycle cooling water in the steam and power system for SSES that are subject to AMR. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that no components under this commodity group exist in the Steam and Power Conversion System. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result lines in the GALL Report is not applicable to SSES.

In LRA Table 3.4.1, items 31, 32, 33, and 34, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because only the main condenser in the steam and power conversion system contains steel components that are subject to AMR and exposed to raw water. The applicant further stated that no aging effects were identified that could affect the intended function of Isolated Condenser Treatment Method (ICTM) volume for these components. The staff reviewed the system intended function provided in LRA Section 2.3.4.4 and noted that the intended function is to support the MSIV leakage ICTM by providing hold-up and plate-out of fission products.

The staff found that, to maintain the intended function of plateout and holdup during post-accident conditions, the main condenser and main condenser complex components must remain intact. The staff noted that normal plant operations monitor condenser vacuum continuously to verify its integrity, and that the acceptable performance of the main condenser during normal plant operation is adequate assurance that it will perform the plateout and holdup post-accident function. Therefore, the staff agrees with the applicant’s conclusion that no AMP is required to assure the post-accident intended function and that this aging effect is not applicable, and the staff finds that the corresponding AMR result line in the GALL Report is not applicable to SSES.

In LRA Table 3.4.1, item 36, the applicant states for this line item there are no gray cast iron piping, piping, components or piping elements that are subject to AMR and exposed to soil, treated water or raw water in the steam and power conversion system for SSES. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that no components under this commodity group exist in the Steam and Power Conversion System. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result lines in the GALL Report is not applicable to SSES.

In LRA Table 3.4.1, item 40, the applicant states for this line item, there are no glass piping elements in the steam and power conversion system for SSES. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that no components under this commodity group exist in the Steam and Power Conversion System. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result lines in the GALL Report is not applicable to SSES.

In LRA Table 3.4.1, item 42, the applicant states for this line item, indoor environments are considered to be uncontrolled. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that the components under the this commodity group: steel piping, piping components, and piping elements, are evaluated as exposed to uncontrolled air under line item 3.4.1-28. On the basis that this commodity group has been evaluated, the staff agreed with the applicant's statement that this line item is not applicable.

In LRA Table 3.4.1, item 43, the applicant states for this line item, there are no components in the steam and power conversion system for SSES embedded in concrete. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that no components under this commodity group exist in the Steam and Power Conversion System. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result lines in the GALL Report is not applicable to SSES.

3.4.2.1.2 Loss of material due to general corrosion

In Table 3.4.2-6, the LRA states that loss of material of main steam system steel piping in an external environment of indoor air is managed by the Supplementary Piping/Tank Inspection Program.

During the audit, the staff noted that the applicant applied note E to this item and referenced LRA Table 3.4-1, item 3.4.1-28 and GALL Report Volume 2, item VII.H-7. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M36, "External Surface Monitoring", the applicant proposed using the Supplementary Piping/Tank Inspection Program. The LRA also references footnote 0401, which states that the environment is an aggressive air/water interface in the suppression pool. The staff determined that in this environment, loss of material is due to crevice and pitting corrosion on the inside surface of SRV discharge piping at air/water interface in the suppression pool, and also, on the outside surface of SRV discharge piping at air/water interface in the suppression pool.

However, the discussion column of Table 3.4.1, line item 3.4.1-28 only credits the System Walkdown Program, and does not address the Supplementary Piping/Tank Inspection Program. The staff issued RAI 3.4.2.1-1 by letter dated July 23, 2008 to request the applicant to clarify this discrepancy.

Furthermore, for the same air/water interface environment, in some cases the LRA tables reference footnote "G" or "H" and in some cases, they reference footnote "E." RAI 3.4.2-1 also requested to clarify this discrepancy.

In its letter dated August 22, 2008, the applicant responded to RAI 3.4.2.1-1 by amending the LRA to include the following paragraph in the discussion column of Table 3.4.1, item 3.4.1-28:

> This item also includes loss of material due to pitting and crevice corrosion at air/water interfaces for carbon steel piping components in an indoor air environment. The Supplemental Piping/Tank Inspection is credited to detect and characterize loss of material for these components. A Note E is used.

On the basis that the applicant amended the LRA to resolve the discrepancy between Table 3.4.1, item 3.4.1-28 discussion column and Table 3.4.2-6, the staff finds the response acceptable.

Furthermore, the applicant stated that the footnote H was used incorrectly and that note E should have been used as per the response provided in RAI 3.2.2.3.1-1 and documented in SER Section 3.2.2.3.1.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff's evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations of air/water interface, and employs more conservative inspection techniques than the visual inspection of External Surfaces Monitoring Program, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

3.4.2.1.3 Wall Thinning due to Flow-Accelerated Corrosion

In its letter dated June 30, 2008, in response to RAI B2.11-1, the applicant stated that wall thinning due to flow-accelerated corrosion of steel main turbine casings in a treated water environment is managed by the Preventive Maintenance Activities – Main Turbine.

The staff noted that the applicant applied note E to this item and referenced Table 3.4-1, item 3.4.1-29 and GALL Report Volume 2, item VIII.B2-4. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M17, "Flow-Accelerated Corrosion", the applicant proposed using the Preventive Maintenance Activities – Main Turbine Program.

The staff reviewed the Preventive Maintenance Activities – Main Turbine Program, which is an existing plant-specific program that will be enhanced to include the inspection of the high pressure turbine shell using visual inspection (VT-3 or equivalent) techniques and an ultrasonic examination for wall thickness. The staff evaluated the Preventive Maintenance Activities – Main Turbine Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff finds the Preventive Maintenance Activities – Main Turbine acceptable to manage the aging effects of loss of material due to flow-accelerated corrosion because the turbine shell will be visually and volumetrically inspected in the presence of the turbine manufacturer representative, and the operating experience review did not indicate any wear on the turbine outer casing during significant modification work performed on these turbines over the last 5 years. On this basis, the staff finds that the Preventive Maintenance Activities – Main Turbine will adequately manage loss of material of steel turbine casing in a treated water environment during the period of extended operation.

3.4.2.1.4 Loss of material due to general, pitting and crevice corrosion

In Table 3.4.2-3, the LRA states that loss of material of condensate transfer and storage system steel valve bodies in an internal environment of ventilation is managed by the Supplementary Piping/Tank Inspection Program.

During the audit, the staff noted that the applicant applied note E to this item and referenced LRA Table 3.4-1, item 3.4.1-30 and GALL Report Volume 2, item VIII.B1-6. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", the applicant proposed using the Supplementary Piping/Tank Inspection Program.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff's evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection employs more conservative inspection techniques than only the visual inspection of Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in an internal environment of ventilation.

SER Section 3.4.2.1 Conclusion: The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.4.2.2, the applicant further evaluates of aging management, as recommended by the GALL Report, for the steam and power conversion systems components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling
- reduction of heat transfer due to fouling
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion
- cracking due to SCC
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and microbiologically-influenced corrosion
- loss of material due to general, pitting, crevice, and galvanic corrosion
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.4.2.2. The staff's review of the applicant's further evaluation follows.

3.4.2.2.1 Cumulative Fatigue Damage

LRA Section 3.4.2.2.1 states that fatigue is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.4.2.2.2 against the following criteria in SRP-LR Section 3.4.2.2.2:

(1) LRA Section 3.4.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in piping, piping components, piping elements, tanks, and heat exchangers. The applicant stated that loss of material due to general, pitting, and crevice corrosion for steel piping components and tanks exposed to treated water in the Steam and Power Conversion System is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion through examination of steel piping components and tanks exposed to treated water.

SRP-LR Section 3.4.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water and for steel piping, piping components, and piping elements exposed to steam. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components and susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that the applicant combined components from LRA Table 3.4.1, item 2 with components in LRA Table 3.4.1, item 4 for the purpose of aging management review. The staff finds this acceptable because the material, environment and aging effect for item 3.4.1-2 is the same as for item 3.4.2 4 except that the environment in item 3.4.1-2 is steam and in item 3.4.1-4 is liquid, and with regard to loss of material due to corrosion, the aging effects in a liquid and in a steam environment are identical for steel components. On this basis, the staff finds the application treatment of LRA Table item 3.4.1-2 as acceptable

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, determined that the BWR Water Chemistry Program is consistent with the GALL Report's recommendations for AMP XI.M2, "Water Chemistry," and provides mitigation for the aging effect of loss of material due to general, pitting, crevice, and galvanic corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to general, pitting crevice, and galvanic corrosion, if it should occur in the selected components. Based on the applicant's use of a water chemistry program that provides mitigation of the aging effect and use of a one-time inspection to confirm effectiveness of the water chemistry program consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the potential aging effect of loss of material due to general, pitting, crevice, and galvanic corrosion, in steel piping, piping components, piping elements, and tanks exposed to treated water or to steam in the feedwater system, the condensate storage and transfer system, the makeup demineralizer system, the makeup transfer and storage system, and the refueling water transfer and storage system to be acceptable.

(2) LRA Section 3.4.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that this aging effect is not applicable because there are no steel components that are exposed to lubricating oil in the steam and power conversion system.

SRP-LR Section 3.4.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lube oil chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed LRA Section 2.3.4 and verified that SSES does not have support systems with-in the scope of license renewal that contain the piping, piping components and piping elements fabricated from steel exposed to lubricating oil.

Based on the staff's review as described above and of LRA Section 3.4 and found that there were no steel piping, piping components and piping elements exposed to lubricating oil internally or externally. On the basis of this review, the staff finds that SRP-LR Section 3.4.2.2.2 Item #2 is not applicable to SSES.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.2 criteria. For those line items that apply to LRA Section 3.4.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

The staff reviewed LRA Section 3.4.2.2.3 against the criteria in SRP-LR Section 3.4.2.2.3.

LRA Section 3.4.2.2.3 addresses loss of material due to general, pitting, crevice, and microbiologically influenced corrosion (MIC), and fouling. The applicant stated that this aging effect is not applicable because the only steam and power conversion components exposed to raw water are the stainless steel tubes inside the main condenser.

SRP-LR Section 3.4.2.2.3 states that loss of material due to general, pitting, and crevice corrosion, and MIC and fouling may occur in steel piping, piping components, and piping elements exposed to raw water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that SSES has no steel piping, piping components, and piping elements exposed to raw water. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to SSES.

Based on the above, the staff concludes SRP-LR Section 3.4.2.2.3 criteria is not applicable.

3.4.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.4.2.2.4 against the following criteria in SRP-LR Section 3.4.2.2.4:

(1) LRA Section 3.4.2.2.4 addresses reduction of heat transfer due to fouling in heat exchanger tubes exposed to treated water. The applicant stated that this aging effect is not applicable because there are no heat exchanger tubes exposed to treated water in the steam and power conversion system that perform an intended function of heat transfer.

    SRP-LR Section 3.4.2.2.4 states that reduction of heat transfer due to fouling may occur in stainless steel and copper alloy heat exchanger tubes exposed to treated water. The existing AMP controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may not always be fully effective in precluding fouling; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

    The staff reviewed the AMR Tables in LRA Section 3.4 and plant basis documents and found that there were no stainless steel and copper alloy heat exchanger components identified with a heat transfer function exposed to treated water. On the basis of this review, the staff finds that this SRP-LR Section is not applicable to SSES.

(2) LRA Section 3.4.2.2.4 addresses reduction of heat transfer due to fouling in heat exchanger tubes exposed to lubricating oil. The applicant stated that this aging effect is not applicable because there are no heat exchanger tubes exposed to lubricating oil in

the steam and power conversion system.

SRP-LR Section 3.4.2.2.4 states that reduction of heat transfer due to fouling may occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The existing AMP monitors and controls lube oil chemistry to mitigate reduction of heat transfer due to fouling. However, control of lube oil chemistry may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that fouling does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of lube oil chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed the AMR Tables in LRA Section 3.4 and plant basis documents and found that there were no steel, stainless steel and copper alloy heat exchanger components identified with a heat transfer function exposed to lubricating oil. On the basis of this review, the staff finds that this SRP-LR Section is not applicable to SSES.

Based on the above, the staff concludes SRP-LR Section 3.4.2.2.4 criteria are not applicable.

3.4.2.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.4.2.2.5 against the following criteria in SRP-LR Section 3.4.2.2.5:

(1) LRA Section 3.4.2.2.5 addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in piping, piping components, and piping elements exposed to soil. The applicant stated that this aging effect is not applicable because there are no steel piping components or tanks exposed to soil in the steam and power conversion system.

SRP-LR Section 3.4.2.2.5 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, piping elements, and tanks exposed to soil. The buried piping and tanks inspection program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion, and MIC.

The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components to ensure that loss of material does not occur.

The staff reviewed LRA Section 2.3.4 and verified that SSES does not have support systems with-in the scope of license renewal that contain steel (with or without coating or wrapping) piping, piping components, piping elements and tanks exposed to soil

Based on the staff's review as described above and of LRA Section 3.4, the staff found that there were no stainless steel piping, piping components and elements and heat exchanger components exposed to lubricating oil internally or externally. On the basis of this review, the staff finds that SRP-LR Section 3.4.2.2.5.1 is not applicable to SSES.

(2) LRA Section 3.4.2.2.5 addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in heat exchanger components exposed to lubricating oil. The applicant stated that this aging effect is not applicable because there are no steel heat exchanger components exposed to lubricating oil in the steam and power conversion system.

SRP-LR Section 3.4.2.2.5 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the AMR Tables in LRA Section 3.4 and plant basis documents and found that there were no steel heat exchanger components identified with a heat transfer function exposed to treated water. On the basis of this review, the staff finds that this SRP-LR Section is not applicable to SSES.

Based on the above, the staff concludes SRP-LR Section 3.4.2.2.5 criteria is not applicable.

3.4.2.2.6 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.4.2.2.6 against the criteria in SRP-LR Section 3.4.2.2.6.

LRA Section 3.4.2.2.6 addresses cracking due to stress corrosion cracking (SCC). The applicant states that cracking due to SCC for stainless steel piping components exposed to treated water or steam in the Steam and Power Conversion Systems is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry Program to manage cracking due to SCC through examination of stainless steel piping components exposed to treated water or steam.

SRP-LR Section 3.4.2.2.6 states that cracking due to SCC may occur in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60℃ (140℉) and in stainless steel piping, piping components, and piping elements exposed to steam. The existing AMP monitors and controls water chemistry to manage the effects of cracking due to SCC. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause SCC; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that SCC does not occur. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that SCC does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that the applicant combined components from LRA Table 3.4.1, item 3.4.1-14 with components in LRA Table 3.4.1, item 3.4.1-13, for the purpose of aging management review. The applicant described this in the discussion column for LRA Table 3.4.1, item 3.4.1-14. The staff noted that the material, environment, aging effect and recommended AMPs for item 3.4.1-14 are the same as for item 3.4.1-13, except that the environment in item 3.4.1-13 is steam (vaporized treated water) and in item 3.4.1-14 is liquid (treated water) at temperature >60ºC (>140ºF). On the basis that the material, environment, aging effect and recommended AMPs are the the identical in LRA Table 3.4.1, items 3.4.1-13 and 3.4.1-14 (except for difference in liquid/vapor phase), the staff finds it acceptable for the applicant to address all components associated with these two lines under Table 3.4.1, item 3.4.1-13.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, determined that the BWR Water Chemistry Program is consistent with the GALL Report's recommendations for AMP XI.M2, "Water Chemistry," and provides mitigation for the aging effect of cracking due to SCC. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The applicant's Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and uses inspection techniques that are capable of detecting cracking due to SCC, if it should occur in the selected components. Based on the applicant's use of a chemistry program that provides mitigation of the aging effect and a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the aging effect of cracking due to SCC in stainless steel piping components exposed to treated water >60ºC (>140ºF) or to steam in the steam and power conversion system to be acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.6 criteria. For those line items that apply to LRA Section 3.4.2.2.6, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.7 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.4.2.2.7 against the following criteria in SRP-LR Section 3.4.2.2.7:

(1) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion in piping, piping components, piping elements, tanks, and heat exchanger components. The applicant states that there are no aging effects identified for aluminum piping components subject to aging management review in the Steam and Power Conversion System. Loss of material due to pitting and crevice corrosion for stainless steel piping components and tanks, and copper alloy piping components, exposed to treated water in the Steam and Power Conversion System is managed by the BWR Water Chemistry Program. The BWR Water Chemistry Program manages aging effects through periodic monitoring and control of contaminants. The Chemistry Program Effectiveness Inspection will provide a verification of the effectiveness of the BWR Water Chemistry

Program to manage loss of material due to pitting and crevice corrosion through examination of stainless steel piping components and tanks, and copper alloy piping components, exposed to treated water.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements and in stainless steel tanks and heat exchanger components exposed to treated water. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to pitting, and crevice corrosion. However, control of water chemistry may not preclude corrosion at locations with stagnant flow conditions; therefore, the GALL Report recommends that the effectiveness of water chemistry programs should be verified to ensure that corrosion does not occur. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted the applicant's statement that there are no aging effects identified for aluminum piping components subject to AMR in the steam and power conversion system. The staff issued RAI 3.4.2.2.7.1-1 by letter dated July 15, 2008, asking the applicant to clarify whether this statement means that there are no aluminum components in a treated water environment in the steam and power conversion system or that there are such components but no aging effects are identified for those components.

In a letter dated August 15, 2008, the applicant responded to RAI 3.4.2.2.7.1-1 by providing the following response:

There are no aluminum piping components that are in-scope for license renewal and that are exposed to a treated water environment in the steam and power conversion system. The only aluminum piping components that are in-scope for license renewal and that are in the steam and power conversion system are valve bodies in the main steam system. These valve bodies are exposed internally to a dry air-gas environment and externally to indoor air environment as indicated in LRA Table 3.4.2-6.

The staff reviewed the applicant's response and the AMR results for the aluminum valve bodies in LRA Table 3.4.2-6. The staff's evaluation of these components is documented SER Table 3.4.1, item 3.4.1-44, and in SER Section 3.4.2.3. Because there are no aluminum piping components in the steam and power conversion system that are in-scope for license renewal and in a treated water environment, the staff finds the applicant's response to be acceptable. The staff finds the applicant's response acceptable to have resolved the issue raised in RAI 3.4.2.2.7.1 1.

The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, determined that the BWR Water Chemistry Program is consistent with the GALL Report's recommendations for AMP XI.M2, "Water Chemistry," and provides mitigation for the aging effect of loss of material due to pitting and crevice corrosion. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The

Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and is capable of detecting loss of material due to pitting or crevice corrosion, if it should occur in the selected components. Based on the applicant's use of a water chemistry program that provides mitigation of the aging effect and use of a one-time inspection consistent with the recommendations of the GALL Report, the staff finds the applicant's proposed AMPs for managing the potential aging effect of loss of material due to pitting or crevice corrosion in stainless steel piping components and tanks and copper alloy piping components exposed to treated water in the steam and power conversion system to be acceptable.

(2) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion in piping, piping components, piping elements exposed to soil. The applicant states that loss of material due to pitting and crevice corrosion for stainless steel piping components exposed to soil is managed by the Buried Piping and Tanks Inspection Program.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The applicant has indicated generic note E for this line item which is "Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program." Because the GALL XI.M34, "Buried Piping and Tanks Inspection" Program does not discuss piping and tanks constructed from materials besides carbon steel, GALL calls out a plant-specific aging management program for this buried stainless steel program and specifies further evaluation. The staff reviewed the applicant's Buried Piping and Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.13 found that the Buried Piping Inspection Program is based on the applicant's plant-specific operating experience that uncoated stainless steel buried piping has not experienced degradation. However the applicant has conservatively added the buried stainless steel piping within the scope of this program to ensure that degradation has not occurred. The staff noted that a visual inspection that will be performed by applicant on the buried stainless steel piping within 10-years of entering the period of extended operation will be capable of detecting age-related degradation as a result of loss of material, consistent with the GALL recommendations. The American Water Works Association standard for stainless steel piping is AWWA C220, "Stainless Steel Piping." On the basis of its review, the staff finds the applicant has conservatively included stainless steel piping in the scope of this program to be inspected within 10 years of entering the period of extended operation and that a visual inspection of the external surface will be capable of detecting loss of material.

(3) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion in piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that this aging effect is not applicable because there is no copper alloy piping, piping components, or piping elements that are exposed to lubricating oil in the steam and power conversion system.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed LRA Section 2.3.4 and verified that SSES does not have support systems within the scope of license renewal that contain the piping, piping components and piping elements fabricated from copper alloy exposed to lubricating oil.

Based on the staff's review of LRA Section 3.4 there were no copper alloy piping, piping components and piping elements exposed to lubricating oil internally or externally. On the basis of this review, the staff finds that SRP-LR Section 3.4.2.2.7 Item #3 is not applicable to SSES.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.7 criteria. For those line items that apply to LRA Section 3.4.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.8 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.4.2.2.8 against the criteria in SRP-LR Section 3.4.2.2.8.

LRA Section 3.4.2.2.8 addresses loss of material due to pitting, crevice, and microbiologically influenced corrosion. The applicant stated that this aging effect is not applicable because there are no stainless steel piping, piping components, piping elements, or heat exchanger components exposed to lubricating oil in the steam and power conversion system.

SRP-LR Section 3.4.2.2.8 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed LRA Section 2.3.4 and verified that SSES does not have support systems with-in the scope of license renewal that contain the piping, piping components and elements and heat exchanger components fabricated from stainless steel exposed to lubricating oil.

Based on the staff's review as described above and of LRA Section 3.4 and found that there were no stainless steel piping, piping components and elements and heat exchanger components exposed to lubricating oil internally or externally. On the basis of this review, the staff finds that SRP-LR Section 3.4.2.2.8 is not applicable to SSES.

Based on the above, the staff concludes SRP-LR Section 3.4.2.2.8 criteria are not applicable.
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3.4.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Galvanic Corrosion

The staff reviewed LRA Section 3.4.2.2.9 against the criteria in SRP-LR Section 3.4.2.2.9.

LRA Section 3.4.2.2.9 addresses loss of material due to general, pitting, crevice, and galvanic corrosion. The applicant stated that this aging effect is not applicable because there are no steel heat exchanger components exposed to treated water in the steam and power conversion system.

SRP-LR Section 3.4.2.2.9 states that loss of material due to general, pitting, crevice, and galvanic corrosion may occur in steel heat exchanger components exposed to treated water. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends that the effectiveness of water chemistry should be verified to confirm that corrosion does not occur. A one-time inspection of selected components and susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the AMR Tables in LRA Section 3.4 and found that there were no heat exchanger components exposed to treated water. On the basis of this review, the staff finds that this SRP-LR Section is not applicable to SSES.

Based on the above, the staff concludes SRP-LR Section 3.4.2.2.9 criteria are not applicable.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.4.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.4.2-1 through 3.4.2-10, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.4.2-1 through 3.4.2-10, the applicant indicated, via notes F through J, which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.4.2.3.1 Aging Management Review Results - Auxiliary Boiler System – LRA Table 3.4.2-1

The staff reviewed LRA Table 3.4.2-1, which summarizes the results of AMR evaluations for the auxiliary boiler system component groups. The staff determined that all AMR evaluation results in LRA Table 3.4.2-1 are consistent with the GALL Report.

3.4.2.3.2 Aging Management Review Results - Bypass Steam System – LRA Table 3.4.2-2

The staff reviewed LRA Table 3.4.2-2, which summarizes the results of AMR evaluations for the bypass steam system component groups.

LRA Table 3.4.2-2 summarizes the results of AMRs for bypass steam valve bodies constructed from carbon steel and exposed to indoor air (internal) and treated water (internal) for which the applicant proposed no aging effect and therefore no AMP is required.

The applicant has indicated that generic note I is applicable for these items. Generic note I is "Aging effect in NUREG-1801 for this component, material, and environment is not applicable." The applicant explains in plant specific note 0406 why there are no aging effects requiring management. Plant specific note 0406 states "The assumption is made for license renewal that the occurrence of any aging effects results in minimal impact to the overall volume and surface area associated with the MSIV Leakage ICTM functions of hold-up and plate-out (ICTM Volume), and does not adversely affect the successful performance of this component intended function. This assumption is supported by the fact that vacuum is maintained on the condenser during normal plant operation, and any leakage that enters the condenser post-accident is subsequently released to the atmosphere. Any age-related degradation that impacts normal plant operations would be indicated by a loss of vacuum and be resolved well before any significant impact to the available volume and surface area is experienced (For example, Condenser leakage is typically tracked and reported as Off-gas Flow Rate in support of normal plant operation) . Therefore, since the successful performance of the ICTM function will not be realistically prevented by any age-related degradation, there are no aging effects requiring management for any components of the steam systems if the only component intended function is ICTM Volume." The staff agrees that there will not be an aging mechanism for this material/environment combination because the materials of interest will not be exposed to the environment of indoor air except for brief periods of time.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL

Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.3 Aging Management Review Results - Condensate Transfer and Storage System – LRA Table 3.4.2-3

The staff reviewed LRA Table 3.4.2-3, which summarizes the results of AMR evaluations for the condensate transfer and storage system component groups.

In LRA Table 3.4.2-3, the applicant proposed to manage loss of material due to crevice and pitting corrosion of stainless steel tanks in an internal environment of ventilation at air/water interfaces by using the Supplementary Piping/Tank Inspection Program. The applicant referenced footnote "G" for this line item indicating that environment is not in the GALL Report for this component and material combination.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff's evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.16. Because the Supplementary Piping/Tank Inspection is performed at very specific locations of air/water interface, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

In LRA Tables 3.4.2-3, the applicant proposed to manage cracking in copper alloy piping and piping components in an environment of treated water by using the BWR Water Chemistry Program, alone. The applicant cited generic note G for these AMR results, indicating that the aging effect is not in the GALL Report for this component, material and environment combination. The staff issued RAI 3.2-3 by letter dated July 15, 2008, applicable for these AMR results and for similar AMR results in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, and 3.3.2-25. The RAI asked the applicant to provide a technical justification as to why an inspection program, such as the Chemistry Program Effectiveness Inspection is not needed to confirm that the BWR Water Chemistry Program is effective in preventing the aging effect.

In a letter dated August 15, 2008, the applicant responded to RAI 3.2-3 by providing the following response:

> For the five AMR results lines listed in LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3, where the material is copper alloy, the environment is treated water (internal), and the aging effect is cracking, verification of the effectiveness of the BWR Water Chemistry Program is needed. The Chemistry Program Effectiveness Inspection will provide confirmation of the effectiveness of this program in managing the effects of aging, including cracking in susceptible materials.
>
> LRA Tables 3.2.2-1, 3.2.2-3, 3.3.2-3, 3.3.2-25, and 3.4.2-3 are revised to reflect these results.

The staff reviewed the applicant's response and the associated LRA changes. The staff reviewed the applicant's BWR Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.1, found that the BWR Water Chemistry Program provides mitigation for the aging effect of cracking due to stress corrosion cracking. The staff reviewed the applicant's Chemistry Program Effectiveness Inspection. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.10, found that the Chemistry Program Effectiveness Inspection is a one-time inspection that is consistent with the GALL Report's recommendations for AMP XI.M32, "One-Time Inspection." The Chemistry Program Effectiveness Inspection includes provisions for inspecting selected components in areas of low or stagnant flow and uses examination techniques that are capable of detecting cracking, if it should occur in the selected components. Because the BWR Water Chemistry Program provides mitigation and the Chemistry Program Effectiveness Inspection provides detection of the aging effect if it should occur, the staff finds the applicant's proposed AMPs for managing the potential aging effect of cracking due to stress corrosion cracking in copper alloy piping and piping components exposed to treated water in the condensate transfer and storage system to be acceptable. On this basis, the staff finds that the issue raised in RAI 3.2-3 is resolved by the applicant's LRA changes.

LRA Table 3.4.2-3 summarizes the results of AMRs for the Condensate Transfer and Storage System for valve bodies tubing, and piping constructed from stainless steel and exposed to outdoor air (external) and ventilation (interior) and proposed no aging effect and therefore that no AMP is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is "Environment not in NUREG-1801 for this component and material." The staff confirmed that this environment is not in GALL for this component and material. The staff also agrees that there will not be aging mechanism for this material/environment combination and that no AMP is required. The staff noted that stainless steel is 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, the staff finds that 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 the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.4 Aging Management Review Results - Condenser and Air Removal System – LRA Table 3.4.2-4

The staff reviewed LRA Table 3.4.2-4, which summarizes the results of AMR evaluations for the condenser and air removal system component groups.

In Table 3.4.2-4, the LRA states that for synthetic rubber flexible connections in treated water internal and indoor air external environments in the condenser and air removal system, there are no aging effects requiring management. In RAI 3.4.2.3-1 Part A, by letter dated July 23, 2008, the staff asked the applicant to justify why it had not identified any aging effects requiring management for these system-material-environment combinations. In RAI #3.4.2.3-1, Part B, the staff asked the applicant to identify the rubber material that is used to fabricate the flexible expansion joints in the CAR systems and to identify those material properties and aging effects that could be impacted by exposure of these rubber materials to the treated water and indoor air environments.

In its letter dated August 27, 2008, the applicant responded to the RAI 3.4.2.3-1 Part A, and stated that there were no aging effects identified as requiring management because no aging effects were considered to be of a significance that would prevent the intended function in this application of maintaining the ICTM volume (isolated condenser treatment method) as defined in LRA Table 2.0-1 and discussed in LRA Section 2.3.4.4.

In its response to RAI Part B, the applicant stated that the materials that are used to fabricate acceptable replacements for the flexible expansion joints (condenser boots) in the Condenser and Air Removal System are neoprene-impregnated nylon, or nitrile-impregnated nylon. The applicant also stated that the material properties that could be impacted include hardening (loss of flexibility) and loss of strength. As a result of a further evaluation of the aging management review (AMR) for the Condenser and Air Removal System, the applicant determined that the rubber expansion joints (condenser boots) are subject to replacement on a specified time period in accordance with plant preventive maintenance activities. The applicant further stated that the expansion joints are, therefore, short-lived components and are not subject to aging management review. The applicant amended the LRA to revise Section 3.4.2.1.4 to delete rubber material from the list of materials; and revised Table 3.4.2.1-4, to delete the commodity type rubber flexible connections (expansion joints) in treated water and air-indoor environments.

The staff reviewed the applicant response and noted that the expansion joints are replaced on a specified time period. SRP-LR Section 2.1.3.2.2, “Long-Lived”, identifies long-lived passive structures and components as those that are not subject to periodic replacement based on specified time period. Therefore, staff finds that the rubber expansion joints that are replaced on a specified time period are considered short-lived components and are not subject to aging management review and can be deleted from LRA Table 3.4.2.1-4. On this basis, the staff finds the applicant response acceptable and considers this issue closed.

LRA Table 3.4.2-4 summarizes the results of AMRs for the Condenser and Air Removal System carbon steel piping exposed to treated water (internal), condensers (inlet/outlet water boxes) condensers (tubesheet) and condensers (shell) exposed to indoor air (external) and condensers (inlet/outlet water boxes) condensers (tubesheet), condensers (tubes) and condensers (shell) exposed to raw water (internal) and condensers (tubesheet) and (tubes) exposed to raw water (internal) and condensers (tubesheet) exposed to treated water (external) and stainless steel condensers tube plugs exposed to raw water and treated water (external) and exposed to indoor air (external) and treated water (internal). The applicant proposed that this material-environment combination has no aging effects requiring management and that no AMR is required.

The applicant has indicated that generic note I is applicable for these items. Generic note I 0406 is “Aging effect in NUREG-1801 for this component, material, and environment is not applicable.” Note 0406 states: “The assumption is made for license renewal that the occurrence of any aging effects results in minimal impact to the overall volume and surface area associated with the MSIV Leakage ICTM functions of hold-up and plate-out (ICTM Volume), and does not adversely affect the successful performance of this component intended function. This assumption is supported by the fact that vacuum is maintained on the condenser during normal plant operation, and any leakage that enters the condenser post-accident is subsequently released to the atmosphere. Any age-related degradation that impacts normal plant operations would be indicated by a loss of vacuum and be resolved well before any significant impact to the available volume and surface area is experienced (For example, Condenser in leakage is typically tracked and reported as Off-gas Flow Rate in support of normal plant operation) . Therefore, since the successful performance of the ICTM function will not be realistically prevented by any age-related degradation, there are no aging effects requiring management for any components of the steam systems if the only component intended function is ICTM Volume."

The staff agrees that there will not be an aging mechanism for this material/environment combination because the materials of interest will not be exposed to the environment of indoor air except for brief periods of time and any degradation that would occur would be insignificant.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.5 Aging Management Review Results - Feedwater System – LRA Table 3.4.2-5

The staff reviewed LRA Table 3.4.2-5, which summarizes the results of AMR evaluations for the feedwater system component groups.

In LRA Table 3.4.2-5, the applicant stated that for steel piping and valve bodies in an environment of air-indoor external, there are not aging effects and no aging management program is required. The applicant has indicated that generic note I and specific note 413 are applicable for these items. Generic note I is "Aging effect in NUREG-1801 for this component, material, and environment is not applicable." Note 0413 states: "External surface temperature for this component type is > 100ºC (212ºF), therefore no moisture is present to promote aging."

As noted from Corrosion Handbook by H.H.Uhlig, general corrosion is the result of a chemical or electrochemical reaction between a material and an aggressive environment. The staff further noted that at ordinary temperatures, oxygen and moisture are the primary factors for corrosion to form. Also, both oxygen and moisture must be present because oxygen alone or water free of oxygen does not corrode steel to any extent. The staff noted that the feedwater piping operating temperature is usually above 212 ^{o}F, which is significantly above the ambient temperature inside the plant. The staff determined that at this temperature, moisture will not collect on the external surfaces, but will evaporate and leave the surface dry. Based on this review, the staff finds that for feedwater system steel piping and valve bodies in an environment of indoor-air external, there are no aging effects because for corrosion to occur moisture must be present, and for piping external surface temperatures above 212 ^{o}F, moisture will evaporate and leave the surface dry. Therefore, the staff finds that steel piping and valve bodies in the feedwater system, in an environment of air-indoor external, there are not aging effects and no aging management program is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.6 Aging Management Review Results - Main Steam System – LRA Table 3.4.2-6

The staff reviewed LRA Table 3.4.2-6, which summarizes the results of AMR evaluations for the main steam system component groups.

In LRA Table 3.4.2-6, the applicant proposed to manage loss of material of carbon steel piping and valves in an internal environment of ventilation at air/water interfaces by using the Supplementary Piping/Tank Inspection Program. The applicant referenced footnote “G” for this line item indicating that environment is not in the GALL Report for this component and material combination. The applicant also referenced footnote 0401 which indicates that loss of material is due to crevice and/or pitting corrosion on the inside surface of SRV discharge piping at air/water interface in the suppression pool, and also, on the outside surface of SRV discharge piping at air/water interface in the suppression pool.

The staff reviewed the Supplementary Piping/Tank Inspection Program, which uses a combination of volumetric and visual examination techniques to identify evidence of loss of material or lack thereof. The staff’s evaluation of the Supplementary Piping/Tank Inspection Program is documented in SER Section 3.0.3.1.6. Because the Supplementary Piping/Tank Inspection is performed at very specific locations of air/water interface, and employs a combination of volumetric and visual inspection techniques, the staff finds that the Supplementary Piping/Tank Inspection Program will adequately manage the aging effects of loss of material in this aggressive environment.

LRA Table 3.4.2-6 summarizes the results of AMRs for the Main Steam System line valve bodies and piping constructed from carbon steel and exposed to indoor air (external) and treated water (internal) and the applicant proposed that this material-environment combination has no aging effects requiring management and no AMR is required.

The applicant has indicated that generic note I is applicable for these items. Generic note I 0406 is “Aging effect in NUREG-1801 for this component, material, and environment is not applicable.” Note 0406 states: “The assumption is made for license renewal that the occurrence of any aging effects results in minimal impact to the overall volume and surface area associated with the MSIV Leakage ICTM functions of hold-up and plate-out (ICTM Volume), and does not adversely affect the successful performance of this component intended function. This assumption is supported by the fact that vacuum is maintained on the condenser during normal plant operation, and any leakage that enters the condenser post-accident is subsequently released to the atmosphere. Any age-related degradation that impacts normal plant operations would be indicated by a loss of vacuum and be resolved well before any significant impact to the available volume and surface area is experienced (For example, Condenser in leakage is typically tracked and reported as Off-gas Flow Rate in support of normal plant operation) . Therefore, since the successful performance of the ICTM function will not be realistically prevented by any age-related degradation, there are no aging effects requiring management for any components of the steam systems if the only component intended function is ICTM Volume.”

The staff agrees that there will not be an aging mechanism for this material/environment combination because the materials of interest will not be exposed to the environment of indoor air except for brief periods of time and any degradation that would occur would be insignificant.

LRA Table 3.4.2-6 summarizes the results of AMRs for main steam valve bodies constructed from aluminum and exposed to indoor air (external) and for which the applicant proposed no aging effect and therefore no AMP is required.

The applicant has indicated that generic note G is applicable for these items. Generic note G is “Environment not in NUREG-1801 for this component and material.” However, the staff noted that GALL Report item VII.J-1 addresses this component, material and environment and states that for aluminum piping, piping components, and piping elements in an environment of air-indoor controlled (external), there are no aging effects and no aging management program required. Since the applicant is consistent with the GALL Report, the staff finds that for main steam valve bodies constructed from aluminum and exposed to indoor air (external), there are no aging effects and therefore no AMP is required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.7 Aging Management Review Results - Main Turbine System – LRA Table 3.4.2-7

The staff reviewed LRA Table 3.4.2-7, which summarizes the results of AMR evaluations for the main turbine system component groups.

LRA Table 3.4.2-7 summarizes the results of AMRs for the Main Turbine System turbine casings (low pressure) constructed from carbon steel and exposed to indoor air (external) and treated water (internal) and the applicant proposed that this material-environment combination has no aging effects requiring management and that no AMR is required.

The applicant has indicated that generic note I 0406 is applicable for these items. Generic note I is “Aging effect in NUREG-1801 for this component, material, and environment is not applicable.” Note 0406 states: “The assumption is made for license renewal that the occurrence of any aging effects results in minimal impact to the overall volume and surface area associated with the MSIV Leakage ICTM functions of hold-up and plate-out (ICTM Volume), and does not adversely affect the successful performance of this component intended function. This assumption is supported by the fact that vacuum is maintained on the condenser during normal plant operation, and any leakage that enters the condenser post-accident is subsequently released to the atmosphere. Any age-related degradation that impacts normal plant operations would be indicated by a loss of vacuum and be resolved well before any significant impact to the available volume and surface area is experienced (For example, Condenser in leakage is typically tracked and reported as Off-gas Flow Rate in support of normal plant operation) . Therefore, since the successful performance of the ICTM function will not be realistically prevented by any age-related degradation, there are no aging effects requiring management for any components of the steam systems if the only component intended function is ICTM Volume.”

The staff agrees that there will not be an aging mechanism for this material/environment combination because the materials of interest will not be exposed to the environment of indoor air except for brief periods of time and any degradation that would occur would be insignificant.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL

Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.8 Aging Management Review Results - Makeup Demineralizer System – LRA Table 3.4.2-8

The staff reviewed LRA Table 3.4.2-8, which summarizes the results of AMR evaluations for the makeup demineralizer system component groups. The staff determined that all AMR evaluation results in LRA Table 3.4.2-8 are consistent with the GALL Report.

3.4.2.3.9 Aging Management Review Results - Makeup Transfer and Storage System – LRA Table 3.4.2-9

The staff reviewed LRA Table 3.4.2-9, which summarizes the results of AMR evaluations for the makeup transfer and storage system component groups. The staff determined that all AMR evaluation results in LRA Table 3.4.2-9 are consistent with the GALL Report.

3.4.2.3.10 Aging Management Review Results - Refueling Water Transfer and Storage System – LRA Table 3.4.2-10

The staff reviewed LRA Table 3.4.2-10, which summarizes the results of AMR evaluations for the refueling water transfer and storage system component groups. The staff determined that all AMR evaluation results in LRA Table 3.4.2-10 are consistent with the GALL Report.

3.4.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the steam and power conversion systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5 Aging Management of Containments, Structures, and Component Supports

This section of the SER documents the staff’s review of the applicant’s AMR results for the containments, structures, and components supports components and component groups of:

- Primary Containment
- Reactor Building
- Engineered Safeguards Service Water Pumphouse and Spray Pond
- Circulating Water Pumphouse and Water Treatment Building
- Control Structure
- Diesel Generator ‘A, B, C, And D’ Building
- Diesel Generator ‘E’ Building
- Turbine Building
- Yard Structures
- Bulk Commodities

3.5.1 Summary of Technical Information in the Application

LRA Section 3.5 provides AMR results for the containments, structures, and components supports components and component groups. LRA Table 3.5.1, "Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of the GALL Report," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the containments, structures, and components supports components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry OE in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry OE included a review of the GALL Report and OE issues identified since the issuance of the GALL Report.

3.5.2 Staff Evaluation

The staff reviewed LRA Section 3.5 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the containments, structures, and components supports components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.5.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.5.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.5.2.2.

The staff also conducted a technical review of the remaining AMRs not consistent with or not addressed in the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.5.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's OE to verify the applicant's claims.

Table 3.5-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.5 and addressed in the GALL Report.

Table 3.5-1 Staff Evaluation for Containments, Structures, and Component Supports in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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.	Yes	ISI (IWL) Program (B.2.35)	Consistent with GALL Report, which recommends further evaluation (See SER section 3.5.2.2.1.1)
Concrete elements; All (3.5.1-2)	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Not applicable	Not applicable to SSES for further evaluation (See SER Section 3.5.2.2.1.2)
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.	Yes	Not applicable	Not applicable to SSES for further evaluation (See SER Section 3.5.2.2.1.2)
Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable) (3.5.1-4)	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to SSES (See SER Section 3.5.2.2.1.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel elements: drywell; torus; drywell head; embedded shell and sand pocket regions; drywell support skirt; torus ring girder; downcomers; liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor, suppression chamber (as applicable) (3.5.1-5)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes	ISI (IWE) Program (B.2.34), and Containment Leakage Rate Test Program (B.2.37)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1.4)
Steel elements: steel liner, liner anchors, integral attachments (3.5.1-6)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes	ISI (IWE) Program (B.2.34), and Containment Leakage Rate Test Program (B.2.37)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1.4)
Prestressed containment tendons (3.5.1-7)	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	Not applicable	Not applicable to SSES (See SER Section 3.5.2.1.1 and 3.5.2.2.1.5)
Steel and stainless steel elements: vent line, vent header, vent line bellows; downcomers; (3.5.1-8)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 4.6 and 3.5.2.2.1.6
Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers (3.5.1-9)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1.6 and section 4.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds (3.5.1-10)	Cracking due to SCC	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds.	Yes	Not applicable	Not applicable to SSES for further evaluation (See SER Section 3.5.2.2.1.7)
Stainless steel vent line bellows, (3.5.1-11)	Cracking due to SCC	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examination/ evaluation for bellows assemblies and dissimilar metal welds.	Yes	Not applicable	Not applicable to SSES (See SER Section 3.5.2.2.1.7)
Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers (3.5.1-12)	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J, and supplemented to detect fine cracks	Yes	Not applicable	Not Applicable for further evaluation (See SER Section 3.5.2.2.1.8)
Steel, stainless steel elements, dissimilar metal welds: torus; vent line; vent header; vent line bellows; downcomers (3.5.1-13)	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J, and supplemented to detect fine cracks	Yes	Not applicable	Not Applicable for further evaluation (See SER Section 3.5.2.2.1.8)
Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable) (3.5.1-14)	Loss of material (scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	Yes	Not applicable	Not applicable to SSES for further evaluation (See SER Section 3.5.2.2.1.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable). (3.5.1-15)	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R.	Yes	Not applicable	Not applicable to SSES for further evaluation (See SER Section 3.5.2.2.1.10)
Seals, gaskets, and moisture barriers (3.5.1-16)	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	ISI (IWE) Program	Consistent with GALL Report, (See SER Section 3.5.2.1)
Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms (3.5.1-17)	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and plant Technical Specifications	No	ISI (IWE) Program (B.2.34), Containment Leakage Rate Test Program (B.2.37)	Consistent with GALL Report, (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	No	ISI (IWE) Program (B.2.34), and Containment Leakage Rate Test Program (B.2.37)	Consistent with GALL Report, (See SER Section 3.5.2.1)
Steel elements: stainless steel suppression chamber shell (inner surface) (3.5.1-19)	Cracking due to SCC	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable	Not applicable (See SER Section 3.5.2.2.1.7)
Steel elements: suppression chamber liner (interior surface) (3.5.1-20)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	ISI (IWE) Program (B.2.34), Containment Leakage Rate Test Program (B.2.37), and BWR Water Chemistry Program (B.2.2)	Consistent with the GALL Report, (See SER Section 3.5.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel elements: drywell head and downcomer pipes (3.5.1-21)	Fretting or lock up due to mechanical wear	ISI (IWE)	No	ISI (IWE) Program (B.2.34)	Consistent with the GALL Report, (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)	No	Not applicable	Not applicable to SSES (See SER Section 3.5.2.1.1)
Safety-Related and Other Structures; and Component Supports					
All Groups except Group 6: interior and above grade exterior concrete (3.5.1-23)	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.1)
All Groups except Group 6: interior and above grade exterior concrete (3.5.1-24)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.1)
All Groups except Group 6: steel components: all structural steel (3.5.1-25)	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the Structures Monitoring Program is to include provisions to address protective coating monitoring and maintenance.	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.1)
All Groups except Group 6: accessible and inaccessible concrete: foundation (3.5.1-26)	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.5.2.2.2.1 and 3.5.2.2.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
All Groups except Group 6: accessible and inaccessible interior/exterior concrete (3.5.1-27)	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.5.2.2.2.1 and 3.5.2.2.2.2.2)
Groups 1-3, 5-9: All (3.5.1-28)	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.5.2.2.2.1 and 3.5.2.2.2.2.3)
Groups 1-3, 5-9: foundation (3.5.1-29)	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Sections 3.5.2.2.2.1 and 3.5.2.2.2.2.3)
Group 4: radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; steam generator supports (3.5.1-30)	Lock-up due to wear	ISI (IWF) or Structures Monitoring Program	Yes	ISI (IWF) Program and/or Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.1)
Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation (3.5.1-31)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling), aggressive chemical attack; cracking, loss of bond, and loss of material (spalling, scaling), corrosion of embedded steel	Structures Monitoring Program; examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.2.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations (3.5.1-32)	Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide	Structures Monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.2.5)
Groups 1-5: concrete (3.5.1-33)	Reduction of strength and modulus due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to SSES for further evaluation (See SER Section 3.5.2.2.2.3)
Group 6: Concrete; all (3.5.1-34)	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; cracking, loss of bond, loss of material due to corrosion of embedded steel	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Yes	Water-Control Structures Inspection Program (B.2.40)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.4.1)
Group 6: exterior above and below grade concrete foundation (3.5.1-35)	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	Yes	Water-Control Structures Inspection Program (B.2.40), and Structures Monitoring Program (B.2.39)	Consistent with GALL Report, (See SER Sections 3.5.2.1.5 and 3.5.2.2.2.4.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Group 6: all accessible and inaccessible reinforced concrete (3.5.1-36)	Cracking due to expansion/reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes	Water-Control Structures Inspection Program (B.2.40)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.4.3)
Group 6: exterior above and below grade reinforced concrete foundation interior slab (3.5.1-37)	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	For accessible areas, Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes	Water-Control Structures Inspection Program (B.2.40)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.4.3)
Groups 7, 8: tank liners (3.5.1-38)	Cracking due to SCC; loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not Applicable, which recommends further evaluation (See SER Section 3.5.2.2.2.5)
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-39)	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.6)
Building concrete at locations of expansion and grouted anchors; grout pads for support base plates (3.5.1-40)	Reduction in concrete anchor capacity due to local concrete degradation, service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Vibration isolation elements (3.5.1-41)	Reduction or loss of isolation function, radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2.6)
Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds (3.5.1-42)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	None	Not applicable (See SER Section 3.5.2.2.2.7)
Groups 1-3, 5, 6: all masonry block walls (3.5.1-43)	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Masonry Wall (B.2.38) and Fire Protection (B.2.16) Programs	Consistent with GALL Report, (See SER Section 3.5.2.1.2)
Group 6: elastomer seals, gaskets, and moisture barriers (3.5.1-44)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Structures Monitoring Program (B.2.39) and/or Fire Protection Program	Consistent with GALL Report, (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	No	Water Control Structures Inspection Program (B.2.40)	Consistent with GALL Report
Group 5: fuel pool liners (3.5.1-46)	Cracking due to SCC; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No	BWR Water Chemistry Program (B.2.2) and monitoring of spent fuel pool water level in accordance with Technical Specifications and Leak Chase Channels Monitoring Activities (B.2.47).	Consistent with GALL Report, (See SER Section 3.5.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Group 6: all metal structural members (3.5.1-47)	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	Water Control Structures Inspection Program (B.2.40)	Consistent with GALL Report, (See SER Section 3.5.2.1.3)
Group 6: earthen water control structures - dams, embankments, reservoirs, channels, canals, and ponds (3.5.1-48)	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs	No	Water-Control Structures Inspection Program (B.2.40)	Consistent with GALL Report, (See SER Section 3.5.2.1)
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-49)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	No	BWR Water Chemistry Program (B.2.2) and IWF Program (B.2.36)	Consistent with GALL Report, (See SER Section 3.5.2.1)
Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-50)	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Structures Monitoring Program (B.2.39)	Consistent with GALL Report, (See SER Section 3.5.2.1.4)
Group B1.1: high strength low-alloy bolts (3.5.1-51)	Cracking due to SCC; loss of material due to general corrosion	Bolting Integrity	No	Bolting Integrity Program (B.2.12)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Groups B2, and B4: sliding support bearings and sliding support surfaces (3.5.1-52)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	No	Not applicable	Not applicable to SSES See SER Section 3.5.2.1.1)
Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure (3.5.1-53)	Loss of material due to general and pitting corrosion	ISI (IWF)	No	IWF Program (B.2.36)	Consistent with GALL Report, (See SER Section 3.5.2.1)
Groups B1.1, B1.2, and B1.3: constant and variable load spring hangers; guides; stops; (3.5.1-54)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	ISI (IWF) Program (B.2.36)	Consistent with GALL Report
Steel, galvanized steel, and aluminum support members; welds; bolted connections; support anchorage to building structure (3.5.1-55)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Not applicable	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)	No	Not applicable	Not applicable to SSES (See SER Section 3.5.2.1.1)
Groups B1.1, B1.2, and B1.3: vibration isolation elements (3.5.1-57)	Reduction or loss of isolation function, radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	No	Not applicable	Not applicable to SSES (See SER Section 3.5.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled (3.5.1-58)	None	None	No	None	Consistent with GALL Report
Stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-59)	None	None	No	None	Consistent with GALL Report

The staff's review of the containments, structures, and components supports component groups followed any one of several approaches. One approach, documented in SER Section 3.5.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.5.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.5.2.3, reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the containments, structures, and components supports components is documented in SER Section 3.0.3.

3.5.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.5.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the containments, structures, and components supports components:

- BWR Water Chemistry Program
- Crane Inspection Program
- Fire Protection Program
- Inservice Inspection (ISI) Program - IWE
- Inservice Inspection (ISI) Program - IWL
- Inservice Inspection (ISI) Program - IWF
- Containment Leakage Rate Test Program
- Masonry Wall Program
- Structures Monitoring Program

- RG 1.127 Water-Control Structures Inspection
- Leak Chase Channel Monitoring Activities

LRA Tables 3.5.2-1 through 3.5.2-10 summarize AMRs for the containments, structures, and components supports components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the

AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation follows.

3.5.2.1.1 AMR Results Identified as Not Applicable

LRA Table 3.5.1, items 7, 22, 52, 56, and 57 are identified as "Not Applicable" since the component, material, and environment combination does not exist at SSES. For each of these line items, the staff reviewed the LRA and the applicant's supporting documents, and confirmed the applicant's claim that the component, material, and environment combination does not exist at SSES. Because SSES does not have the component, material, and environment combination for these Table 1 line items, the staff finds that these AMRs are not applicable to SSES.

3.5.2.1.2 Cracking due to restraint shrinkage, creep, and aggressive environment.

In the discussion section of LRA Table 3.5.1, item 3.5.1.43, the applicant stated that cracking due to restraint shrinkage, creep, and aggressive environment is managed by the Masonry Wall Program. During the review, the staff noted that aging management program for the AMR results line that points to LRA Table 3.5.1, item 3.5.1.43, for five groups the applicant included a reference to Note E and plant-specific Note 516, which states "masonry walls with a fire barrier intended function receive additional inspection as part of the fire protection program."

The staff reviewed the AMR results lines referenced to note E, plant-specific Note 516, 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 AMP XI.S5, "Masonry Wall Program," the applicant has proposed using the Fire Protection Program. The applicant stated that the AMR result line items that reference LRA table 3.5.1 item 3.5.1-43, are also listed as fire barriers that are in the scope for 10 CFR 54.4(a)(2) criterion, and therefore, the Fire Protection Program was also credited. The Fire Protection Program and Masonry Wall Program are performing visual inspections on a periodic basis to manage cracking due to restraint shrinkage, creep, and aggressive environments. On the basis that periodic visual inspections are performed, the staff finds the applicant's use of the Fire Protection Program in conjunction with the Masonry Wall Program to be acceptable.

On the basis 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 AERMs adequately, as recommended by the GALL Report.

3.5.2.1.3 Loss of material due to general (steel only), pitting and crevice corrosion

In the discussion section of LRA Table 3.5.1, item 3.5.1-47, the applicant stated that loss of material due to general, pitting, and crevice corrosion is managed by the Structures Monitoring Program. During the review, the staff noted that for the AMR results line pointing to Table 3.5.1, item 3.5.1-47, for sixteen groups the applicant included a reference to note E and plant-specific Note 526, which states "component is different, but consistent with NUREG-1801 item for material, environment, and aging effect, SSES operating experience has shown of water accumulating in manholes. Therefore, aging mechanisms pertaining to raw water environments are also applicable within manholes, valve vaults, and instrument pits."

The staff reviewed the AMR results lines referenced to note E, plant-specific Note 526, 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 AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," the applicant has proposed using the Structures Monitoring Program (SER Section 3.0.3.2.17). However, the AMR result line items that reference LRA table 3.5.1, item 3.5.1-47, are structural steel members in the Water-Control Structure. However, the Water-Control Structure is in the scope for Structures Monitoring Program and the Structures Monitoring Program performs visual inspections to manage loss of material due to general, pitting, and crevice corrosion. On the basis that periodic visual inspections are performed, the staff finds the applicant's use of the Structures Monitoring Program to be acceptable.
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On the basis 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 AERMs adequately, as recommended by the GALL Report.

3.5.2.1.4 Loss of Material Due to General and Pitting Corrosion

In the discussion section of LRA Table 3.5.1, item 3.5.1-50, the applicant stated that loss of material due to pitting, and crevice corrosion is managed by the Structures Monitoring Program. During the review, the staff noted that for the AMR results line pointing to Table 3.5.1, item 3.5.1-50, for two groups the applicant included a reference to note E.

The staff reviewed the AMR results lines 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 AMP XI.S6, "Structures Monitoring Program," the applicant has proposed using the ASME Section XI, Subsection IWF. However, the AMR result line items that reference LRA table 3.5.1, item 3.5.1-50, are galvanized steels in the component and piping support members, which are in the scope for ASME Section XI, Subsection IWF and not in the Structures Monitoring Program. The ASME Section XI, Subsection IWF and the Structures Monitoring Program perform visual inspections to manage loss of material due to pitting, and crevice corrosion. On the basis that periodic visual inspections are performed, the staff finds the applicant's use of the ASME Section XI, Subsection IWF to be acceptable.

On the basis 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 adequately, as recommended by the GALL Report.

3.5.2.1.5 Loss of material (spalling, scaling) and cracking due to freeze-thaw

In the discussion section of LRA Table 3.5.1, item 3.5.1.35, the applicant stated: loss of material (spalling, scalling) and cracking due to freeze-thaw of group 6 exposed to raw water is managed by Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. During the review, the staff noted that for the AMR results line pointing to Table 3.5.1, item 3.5.1-35, for three groups the applicant included a reference to note E and plant-specific Note 503, which states "the GALL item for freeze-thaw does not list exposed to raw water environment for water control structures. Freeze-thaw may be possible near the water line. This environment is both exposed to raw water; therefore environment is considered a match. The identified AMP is used to manage aging effects for the period of extended operation."

The staff reviewed the AMR results lines referenced to note E, plant-specific Note 503, 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 AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" the applicant has proposed using the Structures Monitoring Program for Table 3.5.1, item 3.5.1-35, which is concrete exposed to raw water environment. Since, the Water-Control Structure is in the scope for Structures Monitoring Program and the Structures Monitoring Program performs visual inspections to manage loss of material (spalling, scalling) and cracking due to freeze-thaw, the staff finds the applicant's use of the Structures Monitoring Program to be acceptable.

On the basis 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 adequately, as recommended by the GALL Report.

<u>SER Section 3.5.2.1 Conclusion:</u> The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

The applicant stated in LRA Section 3.5.2.2.1.1 that the loss of material and change in material properties due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel in inaccessible areas of concrete and steel containments are not aging effects requiring management at SSES because (1) groundwater analyses confirm that the SSES site groundwater is not aggressive, and (2) the design of the SSES containment concrete in accordance with ACI 318-71 and construction in accordance with ACI 301-72 enhance the resistance to chemical attack through the use of dense concrete with low permeability, and generally prevent corrosion of embedded steel from occurring.

The staff reviewed LRA Section 3.5.2.2.1.1 against the criteria in SRP-LR Section 3.5.2.2.1.1, which 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 concrete and steel containments. The existing program relies on ASME Section XI, Subsection IWL to manage these aging effects. The SSES Inservice Inspection (ISI) Program – IWL described in LRA Section B.2.35 is an existing program that is consistent with all elements of GALL AMP XI.S2, “ASME Section XI, Subsection IWL”. The staff’s review of the applicant’s Inservice Inspection (ISI) Program – IWL is documented in SER Section 3.0.3.1.20.

SRP-LR Section 3.5.2.2.1.1 also states that the GALL Report recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas if the environment is aggressive. To ensure non-aggressive groundwater chemistries, the GALL Report suggests the periodic groundwater inspection for chlorides, sulfates, and pH. The staff noted that the applicant’s groundwater inspections are performed by the applicant’s Structures Monitoring Program described in LRA Section B.2.39. The staff’s review of the applicant’s Structures Monitoring Program is documented in SER Section 3.0.3.2.17.

The staff has reviewed the LRA and some associated on-site documents. In addition to the sampling results from 2004 and 2005 presented in the LRA, which indicated groundwater pH minimum value of 5.9, chloride content maximum value of 26 ppm, and sulfate content maximum value of 96 ppm, the staff also checked SSES chemical analysis of groundwater at WW-2 (outside of the Emergency Diesel Generator Building) performed in 2006 and 2007, and found average values for pH 6.11 and 6.13, chloride 23.1 ppm and 40.4 ppm, and sulfate 43.2 ppm and 54.6 ppm, respectively. The staff confirmed that the below-grade environment at SSES is non-aggressive (Chlorides < 500 ppm, Sulfates <1500 ppm, and pH > 5.5).

The staff noticed that SSES concrete is designed in accordance with American Concrete Institute (ACI) 318-71 and constructed in accordance with ACI 301-72. The staff confirmed that concrete constructed to these criteria has a low water-to-cement ratio of less than 0.50 and an adequate air entrainment between 3 and 6%, which is equivalent to ACI 201.2R-77 recommendation on water-to-cement ratio for protecting concrete from chemical attack and recommendation on air contents for resisting freezing and thawing. Therefore, the staff agreed that SSES concrete provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77.

The staff also noted that visual examinations in 2000 revealed surface cracking on the containment exterior and discussed it with the applicant’s technical personnel. The applicant provided documentation showing that the cracking is less than the allowable values per ACI 224R “Control of Cracking in Concrete Structures”, Table 4.1 and acceptable per its appropriate plant specification. The staff further noted that the plant-specific operating experience did not reveal any significant degradation requiring further evaluation. The absence of concrete aging effects is confirmed under the applicant’s Inservice Inspection (ISI) Program – IWL.

On the basis of its review, the staff finds that the 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 are not plausible aging effects at SSES because (1) the plant-specific operating experience did not reveal any degradation not bounded by industry experience, (2) the concrete being constructed meets the intent of ACI 201.2R for durability with a high cement, low water/cement ratio, and (3) the inspection frequency of groundwater chemistries under the applicant’s Structures Monitoring Program agrees with the recommendation of the GALL Report for groundwater monitoring. Therefore, the staff finds that no further evaluation is required.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.1. For those line items that apply to LRA Section 3.5.2.2.1.1, 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).

3.5.2.2.1.2 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

The applicant stated in LRA Section 3.5.2.2.1.2 that 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 are not aging effects requiring management at SSES because (1) SSES does not employ a de-watering system in any of the site structures for control of settlement, (2) the primary containment base foundation slabs rest on competent bedrock and no settlement has been experienced, and (3) the primary containment base foundation slabs are not constructed of porous concrete below-grade and are not subject to flowing water.

The staff reviewed LRA Section 3.5.2.2.1.2 against the criteria in SRP-LR Section 3.5.2.2.1.2, which states that the cracks and distortion due to increased stress levels from settlement could occur in 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 containments. The existing program relies on the structures monitoring program to manage these aging effects. SRP-LR Section 3.5.2.2.1.2 also states that the GALL Report recommends no further evaluation if this activity is within the scope of the applicant's structures monitoring program.

The SSES Structures Monitoring Program described in LRA Section B.2.39 is an existing program that is consistent, with enhancements, with GALL AMP XI.S6, "Structures Monitoring Program." The staff's review of the applicant's Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff noted that the applicant conservatively elected to use the Structural Monitoring Program to monitor the above-grade exposed containment concrete for the aging effect of cracking and distortion due to settlement.

On the basis of its review, the staff finds that 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 are not plausible aging effects to SSES because the conditions necessary for the aging effects, such as soil environment and flowing water environment, do not exist. The staff also finds that the Structures Monitoring Program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage cracks and distortion due to increased stress levels from settlement, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations. Therefore, the staff finds that no further evaluation is required.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.2. For those line items that apply to LRA Section 3.5.2.2.1.2, the staff determined that the 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).

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

The applicant stated in LRA Section 3.5.2.2.1.3 that during normal operation, containment concrete general area temperatures do not exceed 150°F and local area temperatures do not exceed 200°F

The staff reviewed LRA Section 3.5.2.2.1.3 against the criteria in SRP-LR Section 3.5.2.2.1.3, which states that reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR concrete and steel containments. The GALL Report recommends further evaluation of a plant-specific aging management program if any portion of the concrete containment components exceeds specified temperature limits, i.e., general area temperature greater than 66°C (150°F) and local area temperature greater than 93°C (200°F).

The staff reviewed the LRA and noted that no portion of the concrete containment components at SSES exceeds the specified temperature limits, which are 150 °F for general area and 200 °F for local area. On the basis of its review, the staff finds that reduction of strength and modulus of concrete due to elevated temperatures are not applicable aging effects to SSES because the conditions necessary for the aging effects, such as elevated temperatures, do not exist. Therefore, the staff finds that no further evaluation is required

3.5.2.2.1.4 Loss of Material due to General, Pitting and Crevice Corrosion

The applicant stated in LRA Section 3.5.2.2.1.4 that the loss of material due to general, pitting and crevice corrosion is not a significant aging effect at SSES because (1) the design of the SSES containment concrete in accordance with ACI 318-71 and construction in accordance with ACI 301-72 provide a good quality dense concrete with a low permeability, (2) the SSES concrete containments are located within the Reactor Buildings and are protected from weather, and (3) the design of containment liner is not favorable for capturing moisture between the carbon steel liner and concrete containment wall, as well as between the liner and drywell floor.

The staff reviewed LRA Section 3.5.2.2.1.4 against the criteria in SRP-LR Section 3.5.2.2.1.4, which 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. SRP-LR Section 3.5.2.2.1.4 further states that the existing program relies on ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. The SSES Inservice Inspection (ISI) Program – IWE, described in LRA Section B.3.34, and the Containment Leakage Rate Test Program, described in LRA Section B.3.37, are existing programs that are consistent with all elements of GALL AMP XI.S1, “ASME Section XI, Subsection IWE”, and GALL AMP XI.S4, “10 CFR Part 50, Appendix J”, respectively. The staff’s reviews of the Inservice Inspection (ISI) Program – IWE and Containment Leakage Rate Test Program are documented in SER Section 3.0.3.1.19 and SER Section 3.0.3.1.22, respectively. SRP-LR Section 3.5.2.2.1.4 also states that the GALL Report recommends further evaluation of plant-specific programs to manage this aging effect for inaccessible areas if corrosion is significant.

The staff reviewed the LRA and some associated on-site documents and interviewed the applicant’s technical staff. During the on-site review, the staff noticed that general visual examinations of containment liners and penetrations have revealed flaking, discoloration, light to heavy pitting and corrosion. The applicant provided documentation showing that deficiencies were evaluated and corrected if necessary in accordance with the Inservice Inspection (ISI) Program - IWE. The staff noted that there were no instances of Appendix J test failures due to causes other than valve or flange seat leakage. For these failures, all conditions were evaluated and corrected in accordance with the Containment Leakage Rate Test Program. The plant-specific operating experience did not reveal or indicate any significant degradation in inaccessible areas. The aging effect of loss of material due to general pitting and crevice corrosion for containment steel elements is monitored and managed under the Inservice Inspection (ISI) Program – IWE and Containment Leakage Rate Test Program.

On the basis of its review, the staff determines that loss of material due to general pitting and crevice corrosion is an aging effect for steel elements of accessible and inaccessible areas of containments. The staff finds that applicant's inspections and tests in accordance with the Inservice Inspection (ISI) Program – IWE and Containment Leakage Rate Test Program to manage loss of material due to general pitting and crevice corrosion are adequate because (1) the plant-specific operating experience did not reveal any degradation not bounded by industry experience, (2) the aging effect has been effectively monitored and managed under the aforementioned programs, and (3) the containment concrete in contact with the embedded containment liner at SSES was designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well cured, and low permeability concrete; hence corrosion for inaccessible areas is not expected to be significant for SSES. Therefore, the staff agrees that no additional plant-specific program is required.

Based on the programs identified above, the staff concluded 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 determined that the 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).

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

The staff reviewed LRA Section 3.5.2.2.1.5 against the criteria in SRP-LR Section 3.5.2.2.1.5

SSES Containments are designed and constructed as reinforced concrete structures, not prestressed concrete structures. Therefore, loss of prestress forces due to relaxation, shrinkage, creep and elevated temperature is not an aging effect applicable to SSES Containments.

3.5.2.2.1.6 Cumulative Fatigue Damage

The applicant stated in LRA Section 3.5.2.2.1.6 that fatigue analyses of penetrations, hatches, drywell head, downcomer vents, safety relief valve (SRV) discharge piping, and SRV quenchers are TLAAs as defined in 10 CFR 54.3. Fatigue TLAA are evaluated as documented in LRA Section 4.6

The staff reviewed LRA Section 3.5.2.2.1.6 against the criteria in SRP-LR Section 3.5.2.2.1.6, which states that if included in the current licensing basis, fatigue analyses of suppression pool steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers are TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c).

SER Section 4.6 documents the staff's review of the applicant's evaluation of this TLAA.

3.5.2.2.1.7 Cracking due to Stress Corrosion Cracking (SCC)

The applicant stated in LRA Section 3.5.2.2.1.7 that (1) SCC is not an applicable aging effect primary containment penetration sleeves, vent line headers, and downcomers because they are carbon steel components not susceptible to SCC, and (2) SCC is not an applicable aging effect for dissimilar metal welds in the SSES primary containment penetration sleeves since the welds are not subject to an aggressive chemical environment.

The staff reviewed LRA Section 3.5.2.2.1.7 against the criteria in SRP-LR Section 3.5.2.2.1.7, which states that cracking due to stress corrosion cracking 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 and10 CFR Part 50, Appendix J to manage this aging effect. The GALL Report recommends further evaluation of additional appropriate examinations/evaluations implemented to detect these aging effects for stainless steel penetration sleeves, penetration bellows and dissimilar metal welds, and stainless steel vent line bellows.

The staff noted that the penetration sleeves, vent line headers, and downcomers are carbon steel components. The staff acknowledged that stainless steel must be subject to both high temperature (>140°F) and an aggressive chemical environment to be susceptible to SCC. The staff also noted that the dissimilar metal welds in the penetration sleeves located inside and/or outside the primary containment drywell are within the Reactor Building, and are not subject to an aggressive chemical environment.

On the basis of its review, the staff finds that SCC is not a susceptible aging effect for SSES primary containment penetration sleeves, vent line headers, and downcomers because they are carbon steel components, not stainless steel components. the staff also agrees that cracking due to SCC for dissimilar metal welds in the SSES Primary Containment penetration sleeves is not applicable to SSES since the conditions necessary for SCC, both high temperature(>140 °F) and exposure to an aggressive environment, do not simultaneously exist.

3.5.2.2.1.8 Cracking due to Cyclic Loading

The applicant stated in LRA Section 3.5.2.2.1.8 that SSES penetrations do not use expansion bellows, and penetration sleeves are fabricated of carbon steel. The applicant also addressed cracking due to cyclic loading in shells and penetrations, stating that the SSES AMR results conclude that cracking due to cyclic loading for containment components is not an aging effect requiring management. The applicant explained in the LRA that cyclic loading from plant heatups and cooldowns, containment testing, and from system vibration is very low or limited in numbers of cycles. The SSES analyzed fatigue of cyclic loading for steel elements as a TLAA in LRA Section 4.6.

The staff reviewed LRA Section 3.5.2.2.1.8 against the criteria in SRP-LR Section 3.5.2.2.1.8, which 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 containments and BWR vent header, vent line bellows and downcomers. SRP-LR Section 3.5.2.2.1.8 also states that the existing program relies on ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J to manage this aging effect. The SSES Inservice Inspection (ISI) Program – IWE and Containment Leakage Rate Test Program are existing programs that are consistent with all elements of GALL AMP XI.S1, “ASME Section XI, Subsection IWE”, and GALL AMP XI.S4, “10 CFR Part 50, Appendix J”, respectively. The staff’s reviews of the Inservice Inspection (ISI) Program – IWE and Containment Leakage Rate Test Program are documented in SER Section 3.0.3.1.19 and SER Section 3.0.3.1.22, respectively. The GALL Report recommends further evaluation for detection of this aging effect.

The staff reviewed the AMR and its associated AMPs in the LRA. During the on-site review of the associated AMPs, the staff also interviewed applicant’s technical personnel. The staff confirmed that SSES operating experience did not identify any events related to cyclic loading induced cracking of containment components, and the number of loading cycles is very low or limited. For steel elements, fatigue of cyclic loading for steel elements has been analyzed as a TLAA. The staff’s review of the TLAA is documented in SER Section 4.6.

On the basis of its review, the staff finds that cracking due to cyclic loading is not an applicable aging effect for penetration bellows and penetration sleeves because SSES penetrations do not use expansion bellows, and penetration sleeves are fabricated of carbon steel. The staff also agrees that cracking due to cyclic loading for steel and stainless steel elements of containments and vent header, vent line bellows and downcomers is not a plausible aging effect at SSES because the conditions necessary for cracking, the number of loading cycles, is not sufficient to initiate cracking. Therefore, the staff determines that no further evaluation is required.

3.5.2.2.1.9 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.

SSES primary containments are located within the reactor buildings. The staff finds that loss of material (scaling, cracking, and spalling) due to freeze-thaw is not an aging effect applicable to containments because loss of material (scaling, cracking, and spalling) due to freeze-thaw is applicable only to concrete containments exposed to weather.

3.5.2.2.1.10 Cracking due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide

The applicant stated in LRA Section 3.5.2.2.1.10 that cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide are not aging effects requiring management at SSES because (1) aggregates used in SSES containment concrete structures were selected based on testing per ASTM C-289 “Potential Reactivity of Aggregate” and C-295 “Petrographic Examination”, (2) SSES specification for concrete prohibits the use of calcium chloride in the concrete mix design, (3) the SSES Primary Containment concrete is not exposed to flowing water, and (4) resistance to leaching is enhanced by using a dense, well-cured, low permeable concrete in accordance with accepted ACI Standards.

The staff reviewed LRA Section 3.5.2.2.1.10 against the criteria in SRP-LR Section 3.5.2.2.1.10, which states that cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide could occur in concrete elements of concrete and steel containments. SRP-LR Section 3.5.2.2.1.10 also states that the existing program relies on ASME Section XI, Subsection IWL to manage these aging effects. The SSES Inservice Inspection (ISI) Program – IWL described in LRA B.2.35 is an existing program that is consistent with all elements of GALL AMP XI.S2, “ASME Section XI, Subsection IWL”. The staff’s review of the applicant’s Inservice Inspection (ISI) Program – IWL is documented in SER Section 3.0.3.1.20. SRP-LR Section 3.5.2.2.1.10 further states that the GALL Report recommends further evaluation if concrete was not constructed in accordance with the recommendations in ACI 201.2R-77.

The staff reviewed the LRA including the AMR and the associated AMP, and the UFSAR. During the on-site review of the associated AMP, the staff also interviewed applicant’s technical personnel. The staff confirmed that the containment concrete structures are designed in accordance with ACI 318-71 and constructed in accordance with ACI 301-72, which meets the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1, and the SSES containment concrete aggregates are selected in accordance with ASTM standards, which meets the GALL recommendation of investigations, tests, and petrographic examinations of aggregates performed in accordance with ASTM C295-54 or ASTM C227-50 as described in NUREG-1557. The staff also noted that leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water; however the SSES containment concrete is not exposed to flowing water.

On the basis of its review, the staff agrees that cracking due to expansion and reaction with aggregate, increase in porosity and permeability due to leaching of calcium hydroxide are not plausible aging effects for concrete elements of containments because (1) the absence of the aging effects is confirmed under the Inservice Inspection (ISI) Program – IWL, (2) the material selection in accordance with ASTM standards ensures nonreactive concrete aggregates (3) the design and construction of containment concrete structures in accordance with ACI codes enhances resistance to leaching, and (4) SSES containment concrete is not exposed to flowing water. Therefore, the staff determines that no further evaluation is required.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

The applicant stated in LRA Section 3.5.2.2.2.1 that the Structures Monitoring Program is credited for aging management of these effects/mechanisms for the affected concrete structures and structural components even if the aging management review did not identify aging effects requiring management.

The staff reviewed LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1, which 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, 9 structures; (2) increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, 9 structures; (3) loss of material due to corrosion for Groups 1-5, 7, 8 structures; (4) loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, 7-9 structures; (5) cracking due to expansion and reaction with aggregates for Groups 1-5, 7-9 structures; (6) cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures; and (7) reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation for Groups 1-3, 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, SRP-LR Section 3.5.2.2.2.1 also states that 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 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.

The staff noted that the applicant's Structures Monitoring Program described in LRA Section B.2.39 is credited for aging management of these effects/mechanisms for the affected concrete structures and structural components even if the aging management review did not identify aging effects requiring management. The staff's review of the applicant's Structures Monitoring Program is documented in SER Section 3.0.3.2.17. Additional reviews of specific aging effects/mechanisms are discussed below.

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 not aging effects requiring management for SSES concrete structures components because the below-grade environment for SSES is not aggressive, and concrete is designed in accordance with specification ACI 318-71, and constructed in accordance with ACI 301-72. The applicant also stated that concrete constructed to these criteria has a low-water/cement ratio 0.50 or less, adequate air entrainment between 3% and 6% and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. The applicant further stated that the below-grade environment at SSES is non-aggressive and has been confirmed by water chemistry analysis results. Sampling results from 2004 and 2005 indicated ground water pH minimum value at 5.9, chloride content maximum value of 26 ppm, and sulfate content maximum value of 96 ppm. Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not AERMs for SSES Groups 1-5, 7, and 9 structures.

   Through a review of the LRA, the staff determined 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 SSES because of (1) the lack of aggressive groundwater. (2) SSES concrete is designed in accordance with specification ACI 318-71 with a high-cement, low-water/cement ratio, which meets the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1 (3) proper curing, and adequate air content between 3 and 6 percent. The above aging effects for these groups are included within the Structures Monitoring Program by the applicant. Therefore, the staff agrees that the criteria of SRP-LR Section 3.5.2.2.2.1 have been met, and no further evaluation is required.

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 the SSES concrete is designed in accordance with ACI 318-71, and constructed in accordance with ACI 301-72. Concrete constructed to these criteria has a low-water/cement ratio 0.50 or less, adequate air entrainment between 3% and 6% and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77. The applicant further stated that the below-grade environment is not aggressive. Therefore, the applicant concluded that the increase in porosity and permeability cracking and loss of material (spalling, scaling) due to aggressive chemical attack are not AERMs for SSES Groups 1-5, 7, and 9 concrete structures.

Through a review of the LRA, the staff determined 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 SSES because of the lack of aggressive groundwater and the concrete being constructed for durability in accordance with the recommendations that meet the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1. The above aging effects for these groups are included within the Structures Monitoring Program by the applicant. Therefore, the staff agrees that the criteria of SRP-LR Section 3.5.2.2.2.1 have been met, and no further evaluation is required.

3. Loss of Material Due to Corrosion for Groups 1-5, 7, and 8 Structures

The applicant stated in the LRA that SSES Structures Monitoring program is credited for aging management of loss of material due to corrosion for SSES Group 1-5, 7, and 8 structures.

Through a review of the LRA, the staff determined 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. Therefore, the staff agrees that the criteria of SRP-LR Section 3.5.2.2.2.1 have been met, and no further evaluation is required.

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 the SSES concrete is designed in accordance with ACI 318-71, and constructed in accordance with ACI 301-72. Concrete constructed to these criteria has a low-water/cement ratio 0.50 or less, adequate air entrainment between 3% and 6% and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R-77 standards that preclude the freeze-thaw aging mechanism. Therefore, the applicant concluded that loss of material (spalling, scaling) and cracking due to freeze-thaw are not AERMs for SSES Groups 1-3, 5, and 7-9 structures.

Through a review of the LRA, the staff determined 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 SSES because of concrete being constructed in accordance with ACI standards. The above aging effects for these groups are included within the Structures Monitoring Program by the applicant. Therefore, the staff agrees that the criteria of SRP-LR Section 3.5.2.2.2.1 have been met, and no further evaluation is required.

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 SSES concrete is designed in accordance with ACI 318-71, and constructed in accordance with ACI 301-72. Concrete constructed to these criteria has a low-water/cement ratio 0.50 or less, adequate air entrainment between 3% and 6% and provides a good quality dense concrete with a low permeability, which meets the intent of ACI 201.2R. The applicant also stated that the SSES specification requires that the potential reactivity of aggregates be acceptable based on testing in accordance with ASTM C-289 “Potential Reactivity of Aggregate” and C-295 “Petrographic Examination” and the SSES specification for concrete prohibits the use of calcium chloride in the concrete mix design. Therefore, the applicant concluded that cracking due to expansion and reaction with aggregates for Groups 1-3, 5, and 7-9 structures is not an AERM.

Through a review of the LRA, the staff determined that the cracking due to expansion and reaction with aggregates for Groups 1-5 and 7-9 structures are not plausible aging effects at SSES because (1) the material selection in accordance with ASTM standards ensures nonreactive concrete aggregates, and (2) the SSES concrete design in accordance with ACI 318-71 and construction in accordance with ACI 301-72 meet the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1. The staff finds that Groups 1-5, 7- 9 structures subject to this AMR are all in-scope of the Structures Monitoring Program. Therefore, the staff agrees that the criteria of SRP-LR Section 3.5.2.2.2.1 have been met, and no further evaluation is required.

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 reinforced concrete mat foundations have been provided for all structures at SSES and their foundations rest on competent bedrock except for the ESSW Pumphouse, which is supported by natural soil. The applicant also stated that for the past 20 years, the ESSW Pumphouse total differential settlement is well within the permissible limits for this type of structure and no settlement has manifested itself via cracked walls or cracked foundations. Survey readings were carried out for four years and the ESSW Pumphouse had not experienced any significant settlement. No settlement has been experienced for other SSES in-scope structures. SSES does not employ a de-watering system in any of the site structures for control of settlement. Therefore, the applicant concluded that cracks and distortion due to increased stress levels from settlement are not aging effects requiring management for SSES concrete structure components.

Through a review of the LRA, UFSAR Section 2.5.4 “Stability of Subsurface Materials and Foundations” and UFSAR Section 2.5.5 “ Stability of Slops”, the staff determined 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 at SSES because of the nonexistence of these aging mechanisms. The SSES structures are founded on sound bedrock except for the ESSW Pumphouse, which is supported by natural soil. The total differential settlement of ESSW Pumphouse is well below the allowable limits as discussed in UFSAR Sections 2.5.4 and 2.5. The staff finds that Groups 1-5, 7- 9 structures subject to this AMR are all in-scope of the Structures Monitoring Program. Therefore, the staff agrees that the criteria of SRP-LR Section 3.5.2.2.2.1 have been met, and no further evaluation is required.

7. Reduction in Foundation Strength, Cracking, and Differential Settlement Due to Erosion

of Porous Concrete Subfoundation for Groups 1-3 and 5-9 Structures

In the LRA, the applicant stated that reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations are not aging effects requiring management. The applicant also stated that for SSES concrete foundations the concrete foundations at SSES are not constructed with porous concrete and are not subject to flowing water. The applicant further stated that SSES does not employ a de-watering system at any of the site structures for control of settlement.

Through a review of the LRA and UFSAR Appendix 3.8B "Concrete, Concrete Materials, Quallity Control, and Special Construction Techniques", the staff determined that reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for Groups 1-3 and 5-9 structures are not plausible aging effects because of the nonexistence of these aging mechanisms. The staff confirmed from UFSAR Appendix 3.8B that there are no porous concrete subfoundations for these structures. Therefore, the staff finds these aging effects are not applicable to SSES.

8. Lockup Due to Wear for Lubrite® Radial Beam Seats in BWR Drywell and Other Sliding Support Surfaces

In the LRA the applicant stated that Lubrite® plates are not used in SSES in-scope structural components. The applicant also stated that lock-up due to wear is not an aging effect requiring management at SSES. Aging degradations of supports designed with or without sliding connections are managed by the Inservice Inspection (ISI) Program – IWF and/or the Structures Monitoring Program.

Through a review of the LRA, the staff determined that the applicant has credited its Inservice Inspection (ISI – IWF) Program and/or the Structures Monitoring Program to manage aging of Lubrite® and Other Sliding Support Surfaces. The staff finds the applicable AMP(s) acceptable for inspection of Lubrite® and Other Sliding Support Surfaces because the GALL Report recommendation described by the associated tables in CALL Volume 2 "Tabulation of Results" is followed. Therefore, the staff finds that the criteria of SRP-LR Section 3.5.2.2.2.1 have been met, and no further evaluation is required.

On the basis of its review, the staff concluded 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 determined that the 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).

3.5.2.2.2.2 Aging Management of Inaccessible Areas

3.5.2.2.2.2.1 Below-Grade Inaccessible Concrete Areas – Freeze-Thaw

SSES is located in an area in which weathering conditions are considered severe. The applicant stated in LRA Section 3.5.2.2.2.2.1 that loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures are not aging effects requiring management at SSES because (1) SSES structures are designed with proper drainage and slope such that ponding or prolonged exposure to standing water on concrete surfaces is not significant, and (2) the SSES concrete design in accordance with ACI 318-71 and construction in accordance with ACI 301-72, which provided a good quality dense concrete with a low permeability, meet the intent of ACI 201.2R-77.

The staff reviewed LRA Section 3.5.2.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.2.1, which states that 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.

The staff reviewed the LRA. The staff confirmed that the SSES Structures Monitoring Program described in LRA Section B.2.39 is credited for aging management of these effects/mechanisms for the affected concrete structures and structural components. The staff noted that the Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation. The staff found that the SSES concrete air content of 3% to 6%, which follows the GALL recommendation, is documented. The staff determined that the SSES concrete mix design addresses freeze-thaw damage potential by using sufficient air content, which creates a large number of closely spaced, small air bubbles in the hardened concrete. The air bubbles relieve the pressure build-up caused by ice formation by acting as expansion chambers.

On the basis of its review, the staff determines that for SSES, loss of material and cracking due to freeze-thaw are aging effects requiring management for below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures since they are located in an area in which weathering conditions are considered severe. However, the staff finds that the applicant's evaluation acceptable because (1) the applicant's Structures Monitoring Program is credited for aging management of these effects/mechanisms for the affected concrete structures and structural components, which includes examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation, and (2) air content of 3% to 6% at SSES conforms to the recommendation in ACI 201.2R-77 for moderate to severe exposure.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2.1. For those line items that apply to LRA Section 3.5.2.2.2.2.1, the staff determined that the 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).

3.5.2.2.2.2.2 Below-Grade Inaccessible Concrete Areas – Expansion and Reaction with Aggregates

The applicant stated in LRA Section 3.5.2.2.2.2. that cracking due to expansion and reaction with aggregate is not an aging effect requiring management at SSES because (1) the SSES concrete structures are designed in accordance with ACI 318-71 and constructed in accordance with ACI 301-72, (2) aggregates used in SSES concrete structures were selected based on testing per ASTM C-289 “Potential Reactivity of Aggregate” and C-295 “Petrographic Examination”, and (3) the applicant's Structures Monitoring Program is credited for aging management of these effects/mechanisms for the affected concrete structures and structural components, and the Structures Monitoring Program includes examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

The staff reviewed LRA Section 3.5.2.2.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.2.2.2, which states that 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.

The staff has reviewed the LRA and UFSAR. The staff confirmed that the SSES concrete structures are designed and constructed in accordance with accepted ACI codes, which meets the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1, and the SSES concrete aggregates are selected in accordance with ASTM standards, which meets the GALL recommendation of investigations, tests, and petrographic examinations of aggregates performed in accordance with ASTM C295-54 or ASTM C227-50 as described in NUREG-1557. The staff further noted that the Structures Monitoring Program will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

On the basis of its review, the staff agrees that cracking due to expansion and reaction with aggregate is not a plausible aging effect in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures because (1) the material selection in accordance with ASTM standards ensures nonreactive concrete aggregates, (2) the SSES concrete design in accordance with ACI 318-71 and construction in accordance with ACI 301-72 meet the intent of ACI 201.2R-77, and (3) the applicant’s Structures Monitoring Program is credited for aging management of these effects/mechanisms for the affected concrete structures and structural components, which includes examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation. Therefore, the staff determines that no further evaluation is required.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2.2. For those line items that apply to LRA Section 3.5.2.2.2.2.2, the staff determined that the 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).

3.5.2.2.2.2.3 Below-Grade Inaccessible Concrete Areas – Settlement and Erosion

The applicant stated in LRA Section 3.5.2.2.2.2.3 that cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations are not aging effects requiring management for SSES below-grade inaccessible concrete components of Groups 1-3, 5 and 7-9 structures because (1) SSES does not employ a de-watering system in any of the site structures for control of settlement, (2) reinforced concrete mat foundations of all SSES structures, except the ESSW pumphouse, rest on competent bedrock and no settlement has been experienced, (3) the differential settlement of the ESSW pumphouse is well within the permissible limits and wall or foundation crack due to settlement has not been indentified, and (4) SSES base foundation slabs are not constructed of porous concrete below grade.

The staff reviewed LRA Section 3.5.2.2.2.2.3 against the criteria in SRP-LR Section

3.5.2.2.2.2.3, which states that cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures. SRP-LR Section 3.5.2.2.2.2.3 also states that the existing program relies on the Structures Monitoring Program to manage these aging effects. The SSES Structures Monitoring Program described in LRA Section B.2.39 is an existing program that is consistent, with enhancements, with GALL AMP XI.S6, "Structures Monitoring Program." The staff's review of the applicant's Structures Monitoring Program is documented in SER Section 3.0.3.2.17. SRP-LR Section 3.5.2.2.2.2.2 further states that the GALL Report recommends no further evaluation if this activity is included in the scope of the applicant's Structures Monitoring Program.

The staff reviewed the LRA including the AMR and its associated AMP. The staff noted that the SSES base foundation slabs are not constructed of porous concrete below grade. The staff also verified that the differential settlement of the ESSW pumphouse is well within the permissible limits during the on-site review of its associated AMP. The staff further noted that the associated AMP Structures Monitoring Program is credited for aging management of these effects for the affected concrete structures and structural components, and will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

On the basis of its review, the staff finds that 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 are not plausible aging effects in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures because the conditions necessary for aging effects, such as porous concrete material, flowing water environment, and/or soil environment, do not exist. The Structures Monitoring Program is credited for aging management of these effects for the affected concrete structures and structural components. Therefore, the staff finds that no further evaluation is required.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2.3. For those line items that apply to LRA Section 3.5.2.2.2.2.3, the staff determined that the 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).

3.5.2.2.2.2.4 Below-Grade Inaccessible Concrete Areas – Aggressive Chemical Attack and Corrosion of Embedded Steel

The applicant stated in LRA Section 3.5.2.2.2.2.4 that the loss of material and change in material properties due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management at SSES because (1) groundwater analyses confirm that the SSES site groundwater is not aggressive, and (2) the design of the SSES concrete in accordance with ACI 318-71 and construction in accordance with ACI 301-72 enhance the resistance to chemical attack through the use of dense concrete with low permeability, and generally prevent corrosion of embedded steel from occurring.

The staff reviewed LRA Section 3.5.2.2.2.2.4 against the criteria in SRP-LR Section 3.5.2.2.2.2.4, which states that 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 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 the aging effects for inaccessible areas if the environment is aggressive.

To ensure non-aggressive groundwater chemistries, the GALL Report suggests the periodic groundwater inspection for chlorides, sulfates, and pH. The staff noted that the applicant's groundwater inspection program is performed by the applicant's Structures Monitoring Program described in LRA Section B.2.39. The staff's review of the applicant's Structures Monitoring Program is documented in SER Section 3.0.3.2.17.

The staff reviewed the LRA including the AMR and the associated AMP. During on-site review of the associated AMP, the staff reviewed some related on-site documents. The staff noted the plant-specific operating experience did not reveal any significant degradation. The absence of concrete aging effects in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures is confirmed under the Structures Monitoring Program. The staff confirmed that the below-grade environment at SSES is non-aggressive (Chlorides < 500 ppm, Sulfates <1500 ppm, and pH > 5.5). The staff further validated that the Structures Monitoring Program is credited for management of the aging effects, will include review of site ground water and raw water pH, chlorides, and sulfates during the period of extended operation, and will include examination of exposed concrete for age-related degradation when a below-grade concrete component becomes accessible through excavation.

On the basis of its review, the staff finds that the 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 are not plausible aging effects in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures because (1) the plant-specific operating experience did not reveal any degradation not bounded by industry experience, (2) the concrete being constructed meets the intent of ACI 201.2R as discussed in SER Section 3.5.2.2.1.1 for durability with a high cement, low water/cement ratio, and (3) the inspection frequency of groundwater chemistries under the applicant's Structures Monitoring Program agrees with the recommendation of the GALL Report for groundwater monitoring, and to date, the applicant's inspection results show the groundwater is not aggressive. Therefore, the staff finds that no further evaluation is required.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2.4. For those line items that apply to LRA Section 3.5.2.2.2.2.4, the staff determined that the 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).

3.5.2.2.2.2.5 Below-Grade Inaccessible Concrete Areas – Leaching of Calcium Hydroxide

The applicant stated in the LRA Section 3.5.2.2.2.2.5 that cracking increase in porosity and permeability due to leaching of calcium hydroxide is not an aging effect requiring management in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures because (1) the concrete components below grade are not exposed to flowing water, and (2) resistance to leaching is enhanced by using a dense, well-cured, low permeable concrete in accordance with accepted ACI Standards.

The staff reviewed LRA Section 3.5.2.2.2.2.5 against the criteria in SRP-LR Section 3.5.2.2.2.2.5, which states that increase 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. SRP-LR Section 3.5.2.2.2.2.5 further states 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 GALL Report states that an aging management program is not necessary for inaccessible areas, even if reinforced concrete is exposed to flowing water, if there is documented evidence that confirms the in-place concrete was constructed in accordance with the recommendations in ACI 201.2R-77.

The staff reviewed the LRA. The staff noted that the concrete structures are designed in accordance with ACI 318-71 and constructed in accordance with ACI 301-72. The staff also noted that leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water; however, the concrete components below grade are not exposed to flowing water.

On the basis of its review, the staff finds that cracking increase in porosity and permeability due to leaching of calcium hydroxide is not an applicable aging effect in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures because concrete components below grade are not exposed to flowing water, and the design and construction of concrete in accordance with accepted ACI codes meet the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

The staff reviewed LRA Section 3.5.2.2.2.3 against the criteria in SRP-LR Section 3.5.2.2.2.3.

The applicant stated in LRA Section 3.5.2.2.2.3 that SSES in-scope concrete structures and concrete components are maintained below the 150ºF threshold for general areas and under 200°F for local areas.

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. SRP-LR Section 3.5.2.2.2.3 also states 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 reviewed the LRA and noted that no portion of the concrete components at SSES exceeds specified temperature limits, which are 150 °F for general areas and 200 °F for local areas.

On the basis of its review, the staff finds that reduction of strength and modulus of concrete due to elevated temperatures are not applicable aging effects to SSES because the conditions necessary for the aging effects, elevated temperatures, do not exist. Therefore, the staff finds that no further evaluation is required

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

The staff reviewed LRA Section 3.5.2.2.2.4 against the criteria in SRP-LR Section 3.5.2.2.2.4

SRP-LR Section 3.5.2.2.2.4 states that the GALL Report recommends further evaluation for inaccessible areas of certain Group 6 structure/aging effect combinations as identified below, whether or not they are covered by inspections in accordance with the GALL Report, Chapter XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance.

The staff's review and evaluation of aging management of inaccessible areas for Group 6 structures are addressed as follows.

3.5.2.2.2.4.1 Below-Grade Inaccessible Concrete Areas

The applicant stated in the LRA Section 3.5.2.2.2.4.1 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 in below-grade inaccessible concrete areas of Group 6 structures are not aging effects requiring management at SSES because (1) corrosion of structural steel components is addressed by the Structures Monitoring Program. The RG1.127 Water-Control Structures Inspection is credited for aging management of rest of the aging effects/mechanisms, even if the aging management review did not identify aging effects requiring management, (2) analyses confirm that the SSES site environment is not aggressive, and (3) the design of the SSES concrete in accordance with ACI 318-71 and construction in accordance with ACI 301-72 enhance the resistance to chemical attack through the use of dense concrete with low permeability, and generally prevent corrosion of embedded steel from occurring.

The staff reviewed LRA Section 3.5.2.2.2.4.1 against the criteria in SRP-LR Section 3.5.2.2.2.4.1, which 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 GALL Report recommends that the existing program relies on "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" for accessible areas. The SSES RG 1.127 Water-Control Structures Inspection described in LRA Section B.2.40 is an existing program that is consistent, with enhancements, with GALL AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants." The staff's review of the applicant's RG 1.127 Water-Control Structures Inspection is documented in SER Section 3.0.3.2.18. For inaccessible areas, the GALL Report recommends an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is nonaggressive; and further evaluation of plant-specific programs to manage these aging effects, if the environment is aggressive.

The staff reviewed the LRA, including the AMR and associated AMPs. The staff noted that the containment concrete structures are designed in accordance with ACI 318-71 and constructed in accordance with ACI 301-72. The staff also validated from applicant's inspection results that the chemistries in groundwater and raw water at SSES are not aggressive.

On the basis of its review, the staff finds that the increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel in below-grade inaccessible concrete areas of Group 6 structures are not plausible aging effects at SSES because (1) the plant-specific operating experience did not reveal any degradation , (2) the concrete being constructed meets the intent of ACI 201.2R as discussed in SER Section 3.5.2.2.1.1 for durability with a high cement, low water/cement ratio, (3) the applicant's inspections of groundwater and raw water chemistries confirm that the environment is not aggressive, and (4) the Structures Monitoring Program and the RG1.127 Water-Control Structures Inspection are credited for aging management of these aging effects/mechanisms, even if the aging management review did not identify aging effects requiring management.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4.1. For those line items that apply to LRA Section 3.5.2.2.2.4.1 the staff determined that the 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).

3.5.2.2.2.4.2 Below-Grade Inaccessible Concrete Areas – Freeze-Thaw

The applicant stated in the LRA Section 3.5.2.2.2.4.2 that SSES is located in an area in which weathering conditions are considered severe. The loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures are aging effects requiring management at SSES because the concrete located in the ESSW Pumphouse, Spray Pond, and the Cooling Tower Basins may become saturated and, therefore, could be susceptible to freeze-thaw. The applicant further stated in LRA Section 3.5.2.2.2.4.2 that the RG 1.127 Water-Control Structures Inspection is credited to monitor for degradation of the Spray Pond and the ESSW Pumphouse. The Structures Monitoring Program is credited to monitor for degradation of the Cooling Tower Basins.

The staff reviewed LRA Section 3.5.2.2.2.4.2 against the criteria in SRP-LR Section 3.5.2.2.2.4.2, which 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 reviewed LRA Section 3.5.2.2.2.4.2. The staff noted that the RG1.127 Water-Control Structures Inspection is credited to monitor for degradation of the Spray Pond and the ESSW Pumphouse. The Structures Monitoring Program is credited to monitor for degradation of the Cooling Tower Basins. The staff's review of the RG1.127 Water-Control Structures Inspection and the Structures Monitoring Program are documented in SER Section 3.0.3.2.18 and 3.0.3.2.17, respectively. The staff verified that the SSES concrete design in accordance with ACI 318-71 and construction in accordance with ACI 301-72, which provided a good quality dense concrete with a low permeability, meet the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1. The staff particularly validated the SSES concrete air content of 3% to 6%, which is consistent with the ACI 201.2R-77 as the GALL recommended.

On the basis of its review, the staff finds that loss of material and cracking due to freeze-thaw are aging effects in below-grade inaccessible concrete areas of Group 6 structures because SSES is located in an area in which weathering conditions are considered severe. Since the design and construction of the SSES concrete is in accordance with the accepted ACI Standards which prevents the freeze-thaw aging mechanism, the staff finds that applicant's inspections in accordance with the RG1.127 Water-Control Structures Inspection, or the Structures Monitoring Program to manage loss of material (spalling, scaling) and cracking due to freeze-thaw in below grade inaccessible concrete areas of Group 6 structures is adequate and no additional plant-specific program is required.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4.2. For those line items that apply to LRA Section 3.5.2.2.2.4.2 the staff determined that the 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).

3.5.2.2.2.4.3 Below-Grade Inaccessible Reinforced Concrete Areas

The applicant stated in LRA Section 3.5.2.2.2.4.3 that cracking due to expansion and reaction with aggregate and reaction with aggregates and increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide are not aging effects requiring management in below grade inaccessible reinforced concrete areas of Group 6 structures because (1) aggregates used in SSES concrete structures were selected based on testing per ASTM C-289 "Potential Reactivity of Aggregate" and C-295 "Petrographic Examination", (2) SSES specification for concrete prohibits the use of calcium chloride in the concrete mix design, (3) resistance to leaching is enhanced by using a dense, well-cured, low permeable concrete in accordance with accepted ACI Standards, and (4) the RG 1.127 Water-Control Structures Inspection is credited for aging management of these effects/mechanisms for the affected concrete structures and structural components, even if the aging management review did not identify aging effects requiring management.

The staff reviewed LRA Section 3.5.2.2.2.4.3 against the criteria in SRP-LR Section 3.5.2.2.2.4.3, which 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 GALL Report recommends that the existing program relies on "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" for accessible areas. The SSES RG1.127 Water-Control Structures Inspection described in LRA Section B.2.40 is an existing program that is consistent, with enhancements, with GALL AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants." The staff's review of the applicant's RG1.127 Water-Control Structures Inspection is documented in SER Section 3.0.3.2.18. For inaccessible areas, the GALL Report recommends that aging management is not necessary if the concrete was constructed in accordance with ACI 201.2R.

The staff reviewed the LRA, including the AMR and the associated AMP. The staff noted that the concrete structures were designed in accordance with ACI 318-71 and constructed in accordance with ACI 301-72, which meets the intent of ACI 201.2R-77 as discussed in SER Section 3.5.2.2.1.1. The staff also validated that aggregates were selected in accordance with ASTM C-289 and C-295 standards, which meets the GALL recommendation of investigations, tests, and petrographic examinations of aggregates performed in accordance with ASTM C295-54 or ASTM C227-50 as described in NUREG-1557. The staff also noted that leaching of calcium hydroxide from reinforced concrete is not significant even if the concrete exposed to flowing water, if the concrete is constructed to ensure that it is dense, well-cured, and has low permeability. Resistance to leaching is enhanced by using a dense, well-cured concrete with low permeability.

On the basis of its review, the staff finds 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 are not plausible aging effects in below-grade inaccessible reinforced concrete areas of Group 6 structures because (1) the material selection in accordance with ASTM standards ensures nonreactive concrete aggregates, (2) the design and construction of SSES concrete structures in accordance with accepted ACI codes meet the intent of ACI 201.2R-77, and (3) the RG 1.127 Water-Control Structures Inspection is credited, and the absence of concrete aging effects is confirmed under the program.

Based on the programs identified above, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4.3. For those line items that apply to LRA Section 3.5.2.2.2.4.3 the staff determined that the 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).

3.5.2.2.2.5 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

The applicant stated in LRA Section 3.5.2.2.2.5 that no tanks with stainless steel liners are included in the structural aging management reviews.

The staff reviewed LRA Section 3.5.2.2.2.5 against the criteria in SRP-LR Section 3.5.2.2.2.5, which 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 reviewed the LRA. The staff noted that no tanks with stainless steel liners are included in the structural aging management reviews. Tanks subject to aging management review are evaluated with their respective mechanical systems.

On the basis of its review, the staff finds that cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion that could occur for Group 7 and 8 stainless steel tank liners exposed to standing water are not applicable since there are no tanks with stainless steel liners included in the structural AMRs. Tanks subject to an AMR are evaluated with their respective mechanical systems.

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

The applicant stated in LRA Section 3.5.2.2.2.6 that the Structures Monitoring Program is credited for aging management of the following effects/mechanisms: (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.

The staff reviewed LRA Section 3.5.2.2.2.6 against the criteria in SRP-LR Section 3.5.2.2.2.6, which 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.

The staff reviewed LRA 3.5.2.2.2.6. The staff noted that the component support/aging effect combinations of (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 are all covered by the structures monitoring program. Therefore, the staff determined that no further evaluation is required.

Based on the programs identified above, the staff concluded 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 determined that the 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).

3.5.2.2.2.7 Cumulative Fatigue Damage due to Cyclic Loading

The applicant stated in LRA Section 3.5.2.2.2.7 that during the process of identifying TLAA in 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 reviewed LRA Section 3.5.2.2.2.7 against the criteria in SRP-LR Section 3.5.2.2.2.7, which states that fatigue of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports is a TLAA as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.3, “Metal Fatigue Analysis,” of this SRP-LR.

The staff reviewed LRA Section 3.5.2.2.2.7. The staff confirmed that no fatigue analyses were identified as TLAAs because no CLB fatigue analysis exists for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3. 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 documents the staff's evaluation of the applicatn's QA program.

3.5.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In the applicant LRA Tables 3.5.2-1 through 3.5.2-10, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.5.2-1 through 3.5.2-10, the applicant indicated, via notes F through J that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicate that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.5.2.3.1 Aging Management Review Results - Primary Containment – LRA Table 3.5.2-1

The staff reviewed LRA Table 3.5.2-1, which summarizes the results of AMR evaluations for the primary containment component groups.

In LRA Table 3.5.2-1, the applicant identified 38 unique component/material/environment/aging effect/AMP groups for the Primary Containment. Thirty have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For seven groups, the applicant proposed to manage concrete material, below grade and protected from weather environment, aging affect none, by using the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states "No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation." The staff disagrees with the applicant's AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Because, the applicant has committed under Structures Monitoring Program to perform ground-water sampling to ensure that the ground-water is non-aggressive, as consistent with the GALL Report Recommendation. Since the applicant has committed to appropriate aging management program for the period of extended operation, the staff finds these AMR results to be acceptable.

For one group, the applicant proposed to manage stainless steel material, aging affect none, by using the ISI-IWE and Containment Leak Rate Test Program. The staff's review of the ISI-IWE and Containment Leak Rate Test Program are documented in SER Section 3.0.3.1.19 and 3.0.3.1.22 respectively. This line item references Note I and plant-specific Note 501 and 506, which states "No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation." And "The process line penetrations are of welded steel construction without expansion bellows, gaskets or sealing compounds. Containment piping and mechanical penetrations do not contain thermal insulation" respectively. The staff disagrees with the applicant's AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMPs are appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Primary Containment 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 Aging Management Review Results - Reactor Building – LRA Table 3.5.2-2

The staff reviewed LRA Table 3.5.2-2, which summarizes the results of AMR evaluations for the reactor building component groups.

In LRA Table 3.5.2-2, the applicant identified 37 unique component/material/environment/aging effect/AMP groups for the Reactor Building. Twenty-seven have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For ten groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states "No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation." The staff disagrees with the applicant's AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Reactor Building 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 Aging Management Review Results – Engineered Safeguards Service Water Pumphouse and Spray Pond – LRA Table 3.5.2-3

The staff reviewed LRA Table 3.5.2-3, which summarizes the results of AMR evaluations for the engineered safeguards service water pumphouse and spray pond component groups.

In LRA Table 3.5.2-3, the applicant identified 23 unique component/material/environment/aging effect/AMP groups for the Engineered Safeguards Service Water Pumphouse and Spray Pond. Thirteen have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For nine groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states "No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation." The staff disagrees with the applicant's AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

For one group, the applicant proposed to manage earthen material, aging affect loss of form, by using the RG 1.127 Water Control Structures Inspection. The staff's review of the RG 1.127 Water Control Structures Inspection is documented in SER Section 3.0.3.2.18. The staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Engineered Safeguards Service Water Pumphouse and Spray Pond 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 Aging Management Review Results – Circulating Water Pumphouse and Water Treatment Building – LRA Table 3.5.2-4

The staff reviewed LRA Table 3.5.2-4, which summarizes the results of AMR evaluations for the circulating water pumphouse and water treatment building component groups.

In LRA Table 3.5.2-4, the applicant identified 20 unique component/material/environment/aging effect/AMP groups for the Circulating Water Pumphouse and Water Treatment Building. Twelve have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For eight groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff's review of the Structures Monitoring

Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states “No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.” The staff disagrees with the applicant’s AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.
On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Circulating Water Pumphouse and Water Treatment Building not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.5 Aging Management Review Results – Control Structure – LRA Table 3.5.2-5

The staff reviewed LRA Table 3.5.2-5, which summarizes the results of AMR evaluations for the control structure component groups.

In LRA Table 3.5.2-5, the applicant identified 17 unique component/material/environment/aging effect/AMP groups for the Control Structure. Nine have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For seven groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff’s review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states “No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.” The staff disagrees with the applicant’s AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

For the remaining one group, the applicant proposed to manage arboron laminate panels material, aging affect none, and aging management program none. These line item reference Note J and plant-specific Note 518, which states “The arboron flooring system panels consist of cellulose based laminate impregnated with thermosetting resins. They are used as raised floor and are located in a mild temperature and humidity controlled environment. SSES plant-specific evaluation concluded no aging management is required for arboron flooring panels.” The staff reviewed the LRA, license design basis documents, EPRI 1002950 Structural Tools, revision 1, August 2003, and the GALL Report and found that these materials do not perform or support any license renewal intended functions that satisfy the scoping criteria of 10 CFR 54.4(a). Therefore, aging management for these materials is not required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Control Structure not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.6 Aging Management Review Results – Diesel Generator ‘A, B, C, and D’ Building – LRA Table 3.5.2-6

The staff reviewed LRA Table 3.5.2-6, which summarizes the results of AMR evaluations for the diesel generator ‘A, B, C, and D’ building component groups.

In LRA Table 3.5.2-6, the applicant identified 19 unique component/material/environment/aging effect/AMP groups for the Diesel Generator ‘A, B, C, and D’ Building. Eight have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For eleven groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff’s review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states “No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.” The staff disagrees with the applicant’s AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Diesel Generator ‘A, B, C, and D’ Building not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.7 Aging Management Review Results – Diesel Generator ‘E’ Building – LRA Table 3.5.2-7

The staff reviewed LRA Table 3.5.2-7, which summarizes the results of AMR evaluations for the diesel generator ‘E’ building component groups.

In LRA Table 3.5.2-7, the applicant identified 13 unique component/material/environment/aging effect/AMP groups for the Diesel Generator ‘E’ Building. Three have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For ten groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff’s review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states “No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.” The staff disagrees with the applicant’s AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Diesel Generator 'E' Building not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.8 Aging Management Review Results – Turbine Building – LRA Table 3.5.2-8

The staff reviewed LRA Table 3.5.2-8, which summarizes the results of AMR evaluations for the turbine building component groups.

In LRA Table 3.5.2-8, the applicant identified 28 unique component/material/environment/aging effect/AMP groups for the Turbine Building. Seventeen have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For eleven groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states "No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation." The staff disagrees with the applicant's AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Turbine Building not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.9 Aging Management Review Results – Yard Structures – LRA Table 3.5.2-9

The staff reviewed LRA Table 3.5.2-9, which summarizes the results of AMR evaluations for the yard structures component groups.

In LRA Table 3.5.2-9, the applicant identified 51 unique component/material/environment/aging effect/AMP groups for the Yard Structures. Twenty six have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For twenty two groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states “No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.” The staff disagrees with the applicant’s AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

For the remaining three groups, the applicant proposed to manage concrete material, aging affect loss of material cracking, by using the Structures Monitoring Program. The staff’s review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note G and plant-specific Note 521, which states “The GALL does not list exposed to raw water environment for this component type. SSES OE has shown cases of water accumulating in manholes, trenches (SBO cables). Therefore, aging mechanisms pertaining to raw water environments are also applicable within manholes, valve vaults, and instrument pits. The identified AMP is used to manage aging effects for the period of extended operation.” The staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Yard Structures not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.10 Aging Management Review Results – Bulk Commodities – LRA Table 3.5.2-10

The staff reviewed LRA Table 3.5.2-10, which summarizes the results of AMR evaluations for the bulk commodities component groups.

In LRA Table 3.5.2-10, the applicant identified 153 unique component/material/environment/aging effect/AMP groups for the Bulk Commodities. One hundred twenty eight have AMR results consistent with GALL, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Volume II line items are appropriate.

For eight groups, the applicant proposed to manage concrete material, aging affect none, by using the Structures Monitoring Program. The staff’s review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. These line items reference Note I and plant-specific Note 501, which states “No applicable aging effects have been identified for the component. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.” The staff disagrees with the applicant’s AMR conclusion that there are no aging effects requiring management for the period of extended operation for these groups. However, the staff finds that the credited AMP is appropriate in each case. Since the applicant has committed to appropriate aging management programs for the period of extended operation, the staff finds these AMR results to be acceptable.

For ten groups, the applicant has none for aging management program to manage stainless steel and aluminum materials (Table 3.5.1 item 3.5.1-50), aging affect none, During the review, the staff noted that the GALL Report recommends the Structures Monitoring Program to manage aging effects of loss of material/pitting and crevice corrosion. These SSES items have the same component, material, and environment combination as in the GALL Report. On May 30, 2008, the staff asked the applicant to provide the technical basis for not following the GALL Report recommendation (RAI 3.5-1). In the letter dated July 08, 2008, the applicant stated that line items (3.5.1-50) for stainless steel material exposed to a weather environment are amended to align with the GALL Report recommendations and Structures Monitoring Program or ISI-IWF aging management programs. The staff reviewed the applicant responses and found them acceptable because, after amending' LRA Table 1, line item 3.5.1-50 will be aligned with the GALL Report Recommendations.

For the remaining seven groups, the applicant has note J for rubber, elastomer, gypsum board, pryocrete grout, fiberglass, and insulation jacket and has none for aging management program to manage an aging effects for these items. The staff reviewed the LRA, license design basis documents, EPRI 1002950 Structural Tools, revision 1, August 2003, and the GALL Report and found that these materials do not perform or support any license renewal intended functions that satisfy the scoping criteria of 10 CFR 54.4(a). Therefore, aging management for these materials is not required.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations for the Bulk Commodities 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 containments, structures, and component supports 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

The following information documents the staff's review of the applicant's AMR results for the electrical and I&C components and component groups of:

- Non-EQ Insulated Cables and Connections
- Metal Enclosed Bus (Non-Segregated)
- High-Voltage Insulators
- Transmission Conductors and Connections

3.6.1 Summary of Technical Information in the Application

LRA Section 3.6 provides AMR results for the electrical and I&C components and component groups. LRA Table 3.6.1, "Summary of Aging Management Programs for Electrical and I&C Component Evaluated in Chapter VI of the GALL Report," is a summary comparison of the applicant’s AMRs with those evaluated in the GALL Report for the electrical and I&C components and component groups.

3.6.2 Staff Evaluation

The staff reviewed LRA Section 3.6 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the electrical and I&C components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff reviewed AMRs to ensure the applicant’s claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant has identified the appropriate GALL Report AMPs. The staff’s evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff’s evaluation are documented in SER Section 3.6.2.1.

The staff also reviewed AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant’s further evaluations were consistent with the SRP-LR Section 3.6.2.2 acceptance criteria. The staff’s evaluations are documented in SER Section 3.6.2.2.

The staff also reviewed the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff’s evaluations are documented in SER Section 3.6.2.3.

Table 3.6-1 summarizes the staff’s evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.6 and addressed in the GALL Report.

Table 3.6-1 Staff Evaluation for Electrical and Instrumentation and Controls in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements (3.6.1-1)	Degradation due to various aging mechanisms	Environmental Qualification of Electric Components	Yes	TLAA Environmental Qualification of Electrical Components (B.3.2)	Further evaluation, (See Section 3.6.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements (3.6.1-2)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	No	Non-EQ Electrical Cables and Connections Visual Inspection Program (B.2.41)	Consistent with GALL (See 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 (3.6.1-3)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables And Connections Used In Instrumentation Circuits Not Subject to 10 CFR 50.49 EQ Requirements	No	Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program (B.2.42)	Consistent with GALL (See 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	No	Non-EQ Inaccessible Medium-Voltage Cables Program (B.2.43)	Consistent with GALL (See Section 3.6.2.1)
Connector contacts for electrical connectors exposed to borated water leakage (3.6.1-5)	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	No	Not applicable	Not applicable to BWR
Fuse Holders (Not Part of a Larger Assembly): Fuse holders - metallic clamp (3.6.1-6)	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	No	Fuse Holders Program (B.2.50)	Not Consistent with GALL (See Section 3.6.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Metal enclosed bus - bus, connections (3.6.1-7)	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Metal Enclosed Bus Inspection Program (B.2.44)	Consistent with GALL (See 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	No	Metal Enclosed Bus Inspection Program (B.2.44)	Consistent with GALL (See Section 3.6.2.1)
Metal enclosed bus - enclosure assemblies (3.6.1-9)	Loss of material due to general corrosion	Structures Monitoring Program	No	Structures Monitoring Program (B.2.39)	Consistent with GALL (See 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	No	Metal Enclosed Bus Inspection Program (B.2.44)	Consistent with GALL (See Section 3.6.2.1.1)
High-voltage insulators (3.6.1-11)	Degradation of insulation quality due to presence of any salt deposits and surface contamination; loss of material caused by mechanical wear due to wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes	None	Further evaluation (See SER Section 3.6.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Transmission conductors and connections; switchyard bus and connections (3.6.1-12)	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	A plant-specific aging management program is to be evaluated	Yes	None	Further evaluation (See SER Section 3.6.2.2.3)
Cable Connections - metallic parts (3.6.1-13)	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	No	Non-EQ Electrical Cable Connections Program	Consistent with GALL (See Section 3.6.2.1)
Fuse Holders (Not Part of a Larger Assembly) - insulation material (3.6.1-14)	None	None	No	Not applicable	Consistent with GALL (See Section 3.6.2.1)

The staff's review of the electrical and I&C component groups followed any one of several approaches: (1) as documented in SER Section 3.6.2.1, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation, (2) as documented in SER Section 3.6.2.2, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended, or (3) as documented in SER Section 3.6.2.3, the staff reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the electrical and I&C components is documented in SER Section 3.0.3.

3.6.2.1 AMR Results Consistent with the GALL *Report*

LRA Section 3.6.2.1 identifies the materials, environments, aging effects requiring management, and the following programs that manage aging effects for the electrical and I&C components:

- Non-EQ Insulated Cables and Connections Visual Inspection Program
- Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program

- Non-EQ Inaccessible Medium Voltage Cables Program
- Non-EQ Electrical Cable Connections Program
- Metal Enclosed Bus Inspection Program

In LRA Table 3.6.2-1, the applicant summarizes AMRs for the electrical and instrumentation and controls components and claimed that these AMRs are consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which the GALL Report does not recommend further evaluation, the staff's review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff reviewed those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

The staff reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the electrical and I&C components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.6.1, the applicant's references to the GALL Report are acceptable and no further staff review is required.

3.6.2.1.1 Hardening and loss of strength due to elastomer degradation

In the discussion section in LRA Table 3.6.2-1, Note 606, the applicant stated that the inspection of the metal-enclosed bus enclosure assembly elastomers will be performed as part of the metal enclosed bus inspection program. The elastomers will be inspected when the covers of various bus enclosure sections are removed.
The staff noted that in the AMR results line that points to Table 3.6.1, Item 3.6.1-10, the applicant included a reference to Note E.

The staff reviewed the AMR results lines 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 Section 3.0.3.1, 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 proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.6.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the electrical and I&C components and provides information concerning how it will manage the following aging effects:

- Electrical equipment subject to EQ
- Degradation of insulator quality due to salt deposits or surface contamination, loss of material due to mechanical wear
- Loss of material due to wind induced abrasion and fatigue, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the GALL Report recommends further evaluation, the staff reviewed the corresponding AMR line items 3.6.1-11 and 3.6.1-12 in LRA Table 3.6.1. The staff also reviewed applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.6.2.2. The staff's evaluation of items which require further evaluation is discussed below.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

LRA Section 3.6.2.2.1 states that EQ is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.4 documents the staff's review of the applicant's evaluation of this TLAA.

3.6.2.2.2 Degradation of Insulator Quality Due to Salt Deposits or Surface Contamination, Loss of Material Due to Mechanical Wear

The staff reviewed LRA Section 3.6.2.2.2 against the criteria in SRP-LR Section 3.6.2.2.2. In LRA Section 3.6.2.2.2, the applicant states that there are no aging effects identified that require aging management for the high-voltage insulators subject to AMR for SSES. Due to its inland location, salt spray from the ocean is not of concern at SSES. The applicant also states that the rural location of SSES provides for minimal contamination from industrial effluents. The buildup of surface contamination is gradual and is periodically washed away by rainfall. The high-voltage insulator within the scope of license renewal are connected to rigid components, such that significant movement is not considered as a stressor, and wear is not identified as an aging mechanism.

The staff reviewed LRA Section 3.6.2.2.2 against the criteria in SRP-LR Section 3.6.2.2.2 which states that degradation of insulator quality due to salt deposits or surface contamination may occur in high-voltage insulators. The GALL Report recommends further evaluation of plant-specific AMPs for plants at locations of potential salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution). Loss of material due to mechanical wear caused by wind on transmission conductors may occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff noted that various airborne material such as dust, salt and industrial effluent can contaminate insulator surfaces. The buildup of surface contamination is gradual and in most areas such contamination is washed away by rain; the glazed insulator surface aids this contamination removal. A large buildup of contamination could enable 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 grater concentrations of airborne particles such as near facilities that discharge soot or near the sea coast where salt spray is prevalent. Since SSES is not located near facilities that discharge soot or near the sea coast, the rate of contamination buildup on the insulators is not significant and is periodically washed away by rainfall. Therefore, the staff found that degradation of insulator due to salt deposit or surface contamination is not an aging effect requiring management for high-voltage insulators.

The staff noted that 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. In LRA Section 3.6.2.2.2, the applicant states that the high-voltage insulators within the scope of license renewal for SSES are connected to rigid components, such that significant movement is not considered as a stressor and wear is not identified as an aging mechanism. However, the applicant did not describe which components are connected to high-voltage insulators for which wear is not an aging mechanism. In a letter dated July 3, 2008, the staff issued RAI 3.6-5 to request the applicant describe components that are connected to high-voltage insulators and explain why wear is not an aging mechanism for these high-voltage insulators. In a letter dated August 5, 2008, the applicant stated that LRA Section 3.6.2.2.2 was revised in response to the staff's RAI 2.5-1 as documented in Reference 3. The amended LRA includes high-voltage insulators in addition to those connected to rigid components. Based on the amended LRA, the components connected to the SSES high-voltage insulators within the scope of license renewal are transmission conductors, transmission towers, dead end structures, switchyard disconnect switches, motor-operated disconnect switches in the transformer yard, and structural supports. The applicant further stated, in essence, that wear is not identified as an aging mechanism for station post-insulators used to support short lengths of switchyard transmission cable and components such as disconnect switches, because there is not movement involved, and consequently no wear. All connections to station post-insulators are solid bolted connections, such that there is no movement. The applicant also stated that a review of the SSES OE did not reveal any failures of high-voltage insulators due to wear, or any significant issues associated with wear.

The staff finds the applicant response acceptable. The staff noted that all connectors to insulators are solid bolted connections and there is no movement involved. The transmission conductors within the scope of license renewal at SSES are in short spans and the surface areas exposed to wind loads are not significant. Furthermore, the applicant has confirmed that it has not identified any loss of material of insulators due to mechanical wear or any significant issues associated with wear. Therefore, the staff determined that loss of material due to wear is not considered an aging effect and will cause a loss of intended functions of the insulators at SSES.

Based on the program identified, the staff concludes that the applicant's programs meet SRP-LR 3.6.2.2.2 criteria. For those line items that apply to LRA Section 3.6.2.2.2, the staff determines that surface contamination and loss of material due to wear is not an applicable aging effect requiring management for high-voltage insulators at SSES and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion and Fatigue, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Pre-Load

In LRA Section 3.6.2.2.3, the applicant states that there is no switchyard bus within the scope of license renewal. For transmission conductors and connections subject to AMR, there are no aging effects identified that require aging management. The effects of wind do not require aging management as the sections of transmission conductor in the scope of license renewal are short in length, rigid, and connected to rigid components. The applicant also states that loss of conductor strength due to corrosion of the transmission conductor is not identified as an aging effect due to ample design and a minimal corrosion process at the rural location of SSES. Connection resistance is not identified as a stressor based on the use of good bolting practices and review of site OE.

In the LRA, the applicant further states that the most prevalent aging mechanism contributing to loss of conductor strength of aluminum conductor steel reinforced (ACSR) transmission conductors is corrosion. For ACSR conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rate depend largely on air quality, which involves suspended particles in the air, sulfur dioxide (SO2) concentration, rain, fog, chemistry, and other weather conditions. Corrosion of ACSR conductors is a very slow process that is even slower in rural areas with less air pollution. The applicant also states that SSES is located in a rural area in north-central Pennsylvania where airborne particle concentrations are comparatively low.

The applicant also states that test performed by Ontario Hydroelectric showed a 30% composite loss of conductor strength for an 80 year-old sample of an ACSR conductor (due to corrosion). With respect to the Ontario Hydroelectric study, the National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength and that consideration for ice, wind, and temperature be included in the design. With a 30% loss of conductor strength, there is still margin between the NESC requirements and the actual conductor strength. The applicant concluded that because the SSES transmission conductor design and installation meet the NESC requirements, the Ontario Hydro study is considered to bound the SSES configuration.

In addition, the applicant states that increased connection resistance is not identified as an aging effect requiring management. Bolted connected associated with transmission conductors employ the use of good bolting practices consistent with the recommendations of EPRI 1003471, "Electrical Connector Application Guideline." The applicant also states that bolting hardware is selected to be compatible with the lugs used on the transmission conductors and Belleville washers are used to compensate for temperature changes and to maintain proper tightness. The applicant further states that its review of OE revealed no bolted connection failures associated with transmission conductors at SSES.

The applicant did not identify certain components within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(3) for compliance with the SBO rule. In a letter dated July 30, 2007, the staff asked RAI 2.5-1, and the applicant responded by letter dated August 23, 2007 with justification for why the switchyard circuit breakers were not included in the scope of license renewal. In a letter dated May 7, 2008, the applicant amended the LRA to include switchyard circuit breakers and high-voltage insulators within the scope of license renewal. As a result of bringing high-voltage insulators into the scope, the applicant revised LRA Section 3.6.2.2.3 to address aging effects of high-voltage insulators. The applicant stated that loss of material due to mechanical wear is not an aging effect for certain strain insulators if they are subject to significant movement. Movement of the insulator can be caused by wind blowing the supported transmission conductor, causing it to swing from side to side. If this swing is frequent enough, it could cause wear on the metallic contact points of the insulator string and between an insulator and the supporting hardware. The applicant also stated that although this aging mechanism is possible, industry experience has shown that transmission conductors do not normally swing unless subjected to a substantial wind and they stop swinging shortly after the wind subsides. Wind loading that can result in conductor sway is considered in the transmission system design.

The staff reviewed LRA Section 3.6.2.2.3 against SRP-LR Section 3.6.2.2.3 which 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 noted that transmission conductor vibration would be caused by wind loading. Industry experience has shown that the transmission conductors do not normally swing and that when they do, due to a substantial wind, do not continue to swing for very long once the wind has subsided. Wind loading that can cause a transmission line and insulators to vibrate is considered in the design and installation. The sections of transmission conductor in the scope of license renewal are short spans, the surface area exposed to wind loads are not significant. Based on this information, the staff determined that loss of material of transmission conductors due to vibration is not an aging effect requiring management.

The staff also noted that corrosion of ACRS conductors is a slow acting aging effect that is even slower for rural areas such as SSES, which generally has less suspended particles and SO2 concentration in the air than urban areas. The applicant states that a test performed by Ontario Hydroelectric showed a 30% composite loss of conductor strength for an 80 year-old sample of an ACSR conductor (due to corrosion). However, the applicant did not provide detailed information to substantiate the conclusion that the Ontario Hydro Study is valid for SSES. In a letter dated July 3, 2008, the staff issued RAI 3.6-2 to request the applicant to explain the test performed by Ontario Hydroelectric and provide details as how SSES's transmission conductors installed at SSES were bounded by the Ontario Hydro test and will have adequate margin for 60 years.

In response to the staff's request, in a letter dated August 5, 2008, the applicant stated that the tests for Ontario Hydro were conducted in the field and in the laboratory. A nondestructive corrosion detector was modified for live line measurement of the loss of galvanizing from the steel cores of the ACSR conductors. The field measurements were performed using a motorized overhead line corrosion detector that traveled along the transmission line. Samples of the conductors tested in the field also were examined in the lab, through tests of fatigue, tensile strength, torsional ductility, and electrical performance. The applicant also stated that the fatigue and tensile strength testing involved the use of a dynamometer and an electromagnetic shaker, with the conductor strung across a suspension assembly. The NESC requires that the maximum tension of installed conductors shall not be more than 60% of the rated breaking strength under NESC design conditions. NESC design conditions (known as NESC Heavy for all of Pennsylvania) include simultaneous consideration of ice, wind, and temperature. The applicant states that its design criteria for 230kV transmission lines are even more demanding than NESC design criteria (1" radial ice versus 1/2" radial ice and a simultaneous 8 psf wind versus 4 psf wind). The applicant further stated that this conductor loading is higher than NESC and, like NESC, must not exceed 60% rated breaking strength. In addition, the applicant stated that conductor loading requirements are reviewed below for the startup transformer #10 230kv Tap and for the 230kV/500kV yard tie, which operates at 230kV. Both of these lines utilize 1590 kcmil Lapwing 45/7 ACSR conductors. The 1590 describes the cross-sectional area of the conductor in kcmils (1 kcmil = 1000 circular mils, and one circular mil = the cross-sectional area of a circle 1 mil in diameter.). The 45/7 means the conductor has 45 outer strands of aluminum conductor around a two-layer core consisting of 7 strands of galvanized steel wire. The ultimate strength (rated breaking strength) of Lapwing transmission conductor is 42,200 lbs. The applicant also stated that based on a design maximum tension of 21,537 lbs for the startup transformer #10 230kV Tap, the margin between the maximum conductor load and the ultimate conductor strength is 20,663 lbs.; therefore, the margin for ultimate strength is 49%. The applicant further stated that Ontario Hydro study showed a 30% loss of composite conductor strength in the typical 70 year-old conductor. In the case of the Lapwing transmission conductors, a 30% loss of ultimate strength would mean that there would still be adequate margin (46%) between the design maximum load of 21,537 pounds and the eventual conductor strength of 33,085 pounds for the startup transformer #10 230kV Tap (1.12 x 42,200 x 0.7). As noted by Ontario Hydro, "new conductors show an average strength of 112% of rated tensile strength." The 230 kV / 500 kV Yard Tie line has a design maximum conductor tension of 16,000 lbs., and thus, an even greater margin. Both transmission lines exceed the design requirements set forth by the NESC. Therefore, the expected margin at 70 years of age is adequate for these installed transmission conductors at SSES. In addition, the applicant stated that transmission conductor samples tested in the Ontario Hydro Test included samples with 45/7 stranding and are representative of the installed conductors at SSES, so the conclusions from the Ontario Hydroelectric Test Report for the remaining strength after 70 years of installation are both conservative and valid for SSES. Therefore, the applicant concluded that loss of conductor strength due to corrosion of the transmission conductors is not an aging effect requiring management for the period of extended operation.

The staff's review determined that the maximum tension of transmission conductors for start up transformer #10 could be 65% of the rated breaking strength after losing 30% of conductor breaking strength due to corrosion (21537 lbs./(1.12 x 42200 x 70% lbs). NESC requires that the maximum tension of installed conductors shall not be more than 60% of the rated breaking strength. The ratio between the maximum tension and ultimate conductor strength would not meet the NESC design requirements during the period of extended operation. The staff expressed its concern during a conference with the applicant and requested the applicant to explain why loss of conductor strength due to corrosion is not a significant aging effect when these conductors would not meet the NESC design requirement after aging effect.

In a letter dated November 11, 2008, the applicant stated that using the PPL conservative design criteria, the maximum design tension for the conductors in the Startup Transformer #10 Tap is 21,537 pounds. To put these loadings in perspective, the PPL design is compared to the NESC "Heavy" requirements. Based on a simulation using an industry standard sag-tension computer program, the design maximum tension of 21,537 pounds under the PPL criteria of 1" radial ice simultaneously with an 8 psf wind and 0 deg F temperature corresponds to an NESC "Heavy" design maximum tension of 16,195 pounds. The 16,195 pound maximum tension is 38% of rated breaking strength under initial (newly installed conductor) conditions. Therefore, the NESC criteria are met. The applicant further stated that based on the NESC "Heavy" equivalent design maximum tension of 16,195 pounds for the Startup Transformer #10 230kV Tap conductors, the difference between the design maximum conductor load of 16,195 pounds and the ultimate conductor strength is 26,005 pounds, which produces a margin for ultimate strength of 62% [26,005 / 42,200 = 62%]. In addition, the applicant stated that the Ontario Hydro study showed a 30% loss of composite conductor strength in the typical 70 year-old conductor. In the case of the Lapwing transmission conductors, a 30% loss of ultimate strength equates to an eventual conductor strength of 33,085 pounds for the Startup Transformer #10 230kV Tap (1.12 x 42,200 x 0.7). As noted by Ontario Hydro, "new conductors show an average strength of 112% of rated tensile strength." Based on the NESC "Heavy" equivalent design maximum tension of 16,195 pounds for the Startup Transformer #10 230kV Tap conductors, the difference between the design maximum conductor load of 16,195 pounds and the eventual conductor strength of 33,085 is 16,890 pounds, which produces a margin for ultimate strength of 51% [16,890 / 33,085 = 51%]. The applicant concluded that loss of conductor strength due to corrosion of the transmission conductors is not an aging effect requiring management for the period of extended operation.

The staff finds the applicant's response acceptable. The previously heavy loading of 21537 lbs. was based on the heavy loading of 1" radial ice simultaneously with an 8 psf wind on a transmission conductor. The calculated heavy loading of 16890 lbs. was based on NESC heavy loading requirement of a 1/2" radial ice and a simultaneous 4 psf wind. The ratio between the heavy loading and the ultimate conductor strength of a 70 year old transmission conductor (after loosing 30% of conductor strength due to corrosion) is 49% (16890 lbs./1.12 x 42200 lbs. x 0.7). The NESC requires that the maximum tension of installed conductors shall not be more than 60% of the rated breaking strength under NESC design conditions. The ratio of maximum heavy load and the ultimate conductor strength of installed conductors are below the 60% NESC requirements. Furthermore, the length of transmission conductors in-scope of license renewal is short span. These transmission conductors connecting the switchyard to the startup transformer provide restoration of offsite power after a SBO event. The heavy loading of these transmission conductors is much less than the calculated heavy loading of a transmission line. Based on this information, the staff determined that loss of conductor strength due to corrosion of transmission conductor is not a significant aging effect requiring management for the period of extended operation. The staff's concern about loss of conductor strength due to corrosion is resolved.

In LRA Section 3.6.2.2.3, the applicant stated that bolted connections associated with transmission conductors employ the use of good bolting practices consistent with the recommendations of EPRI 1003471, "Electrical Connector Application Guideline." However, the applicant did not explain how its good bolting practices are consistent with EPRI 1003471. In a letter dated July 3, 2008, the staff issued RAI 3.6-3 to request the applicant to describe how the bolted connections associated with transmission conductors at SSES follow EPRI 1003471 recommendations. In their response dated August 5, 2008, the applicant stated that the following bolted connection practices are used at SSES to ensure integrity of transmission conductor bolted connections. These practices are consistent with the design and assembly guidance in EPRI 1003471.

- Washers are used between the connector and bolt heads and nuts to protect the surface of the connector when the bolt is turned.

- Belleville washers are used to keep the load on the connection as the connectors and bolting materials respond to heat up and cool down.

- The use of Belleville washers is predetermined for certain connector and bolting material combinations and specified in the construction specifications.

  • Contact surfaces are cleaned, scoured (except plated surfaces) to remove any oxide coating, wiped with a dry clean cloth, and immediately coated with an oxide inhibiting joint compound.

The applicant also stated that the bolting practices used for SSES transmission conductor connections have been proven by reliable operation of the transmission system and the switchyards associated with SSES.

The staff finds the applicant response acceptable because pre-load of bolted connections is maintained by the use of lock and Belleville washers that absorb vibration and prevent loss of pre-load. Contact surfaces are cleaned and coated with an oxide inhibiting joint compound (a grease- type sealant) to prevent the formation of oxides on the metal surface and to prevent moisture from entering these services, thus reducing changes of corrosion. Based on this information, the staff determines that that the design of transmission connections using Bellville washers will eliminate the potential torque relaxation of bolted connections. This design is consistent with the recommendation in EPRI document TR-104213, "Bolted Joint Maintenance & Application Guide."

However, the staff noted that EPRI document TR-104213 identified a special problem with Belleville washers. Hydrogen embrittlement is a recurring problem with Belleville washers and other springs. When springs are electroplated, the plating process forces hydrogen into the metal grain boundaries. If the hydrogen is not removed, the spring may spontaneously fail at any time while in service. In a letter dated July 3, 2008, the staff issued RAI 3.6-3 (b) to request the applicant to explain if electroplated Belleville washers are currently used at SSES. The staff also requested the applicant to describe activities used to confirm the effectiveness of switchyard bolted connections. In response dated August 5, 2008, the applicant stated that the Belleville washers in use with the transmission conductors are stainless steel and are not electroplated. Therefore, they are not subject to the hydrogen embrittlement aging effect. The applicant also stated that switchyard bolted connections are routinely inspected using thermography to confirm effectiveness of the connections. The staff found the applicant's response acceptable because the special problem with hydrogen embrittlement is not a concern at SSES since the Belleville washers in use with the transmission conductors are stainless steel. The concern with hydrogen embrittlement aging effect is not applicable to SSES. Furthermore, the applicant currently performs routine inspection using thermography to confirm the effectiveness of switchyard connections.

The staff noted that increased resistance of connections due to oxidation could occur in transmission conductors and connections, and in switchyard bus and connections. In LRA Section 3.6.2.2.3, the applicant stated that increased connection resistance is not identified as an aging effect requiring management. However, the applicant did not provide any basis for this conclusion. In a letter dated July 3, 2008, the staff issued RAI 3.6-3.c to request the applicant to explain why increased resistance of connections due to oxidation is not identified as an aging effect requiring management. In a letter dated August 5, 2008, the applicant stated that increased connection resistance of switchyard connections due to oxidation is not identified as an aging effect requiring management because of the use of good bolting practices that include proper cleaning of contact surfaces, application of oxide inhibiting compound, and the use of appropriate hardware to ensure the connection remain tight. These bolting practices minimize the formation of an oxide layer directly at the contact point.

The staff found the applicant response acceptable. The staff noted that proper cleaning of contact surface and using an anti-oxidant compound (grease-type sealant) prior to tightening the connection prevent the formation of oxides on the metal surface and prevent moisture from entering the connection, thus reducing the chances of oxidation. Industry OE has shown that this method of installation provides a corrosion-resistance connection of low electrical resistance. Furthermore, the applicant has stated that connections at the switchyard are periodically evaluated via thermography as a preventive maintenance. On this basis, the staff determined that aging mechanism of increased resistance of connections due to oxidation is not a significant aging effect requiring management at SSES.

Based on the programs identified above, the staff concludes that the applicant's program meet SRP-LR Section 3.6.2.2.3 criteria. For those line items that apply to LRA Section 3.6.2.2.3, the staff determines that loss of material, loss of conductor strength, and increased resistance of connections or loss of preload in transmission conductors and connections, and in switchyard bus and connections, are not applicable to SSES. The applicant has demonstrated that the effect of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program for AMPs.

3.6.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Table 3.6.2-1, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Table 3.6.2-1, the applicant indicated, via notes F through J that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.6.2.3.1 Fuse Holders - Metallic Clamp

In LRA, Table 3.6.1, under Item Number 3.6.1-06, Fuse Holders (Not Part of a Large Assembly), the applicant states that the aging effects detailed in NUREG-1801 are not applicable for this item at SSES. In LRA, Section 3.6.2.3.1, the applicant states that the fuse holders are located in metallic electrical boxes (terminal boxes) which have covers that protect the interior of the box from the environment. The applicant further states that by design, these fuses are not removed more than once per year, therefore, fatigue due to frequent manipulation does not apply. GALL NUREG 1801, Rev. 1, Item VI.A-8 identifies corrosion and fatigue as one of aging effect/mechanism for fuse holders (metallic clamp) and recommends fuse holder AMP XI.E5. Condensation inside fuse panels could create a corrosive environment for fuse holders. Manipulation (removing and inserting) of fuse elements during maintenance could weaken the fuse holder clips and could create fatigue aging effects. In a letter dated July 3, 2008, the staff issued RAI 3.6-1 to request the applicant to explain why corrosion of fuse holders inside fuse panels due to condensation is not an aging effect requiring management. The staff also requested the applicant to provide technical justification of how the manipulation of fuse holders for maintenance activities will not create a fatigue aging effect.

In a letter dated August 5, 2008, the applicant responded that corrosion (due to condensation) in the metallic electrical boxes housing for the fuses within the scope of license renewal and subject to aging management review (AMR) is not expected because the boxes are located in a controlled indoor environment and contain no components that experience temperatures less than ambient. The applicant stated that its inspection of a sample of the 20 in-scope metal electric boxes containing the fuse holders subject to AMR showed no corrosion or evidence of water intrusion or collection. The metallic electrical boxes were clean and dry. The applicant also stated that the additional 20 cycles of fuse removal and insertion in fuse holders, where the fuse is removed once per year, is not expected to create a fatigue aging effect on the fuse holder clips. This conclusion is based on engineering judgment when considering the threshold for low cycle fatigue and the material properties of a typical fuse clip. As stated in EPRI, 1003056, "Non-Class 1 Mechanical Implementation Guidelines and Mechanical Tools," Appendix H, Page 1-1, "Low cycle fatigue failure might occur after fewer than 10,000 cycles but only if strains exceed the yield strain." The applicant further stated that this statement suggests that absent of excessive strain, low cycle fatigue would not be expected until after thousands of cycles, which is many more than the number of cycles projected for the fuse clips in the scope of this AMP. The fuse clip material properties determine what constitutes excessive strain, and because the fuse clips are made from a spring material, it is expected that the alloys used to manufacture the clips will have fairly high yield strengths. The applicant also stated that engineering judgment indicates that the strain created during removal and insertion of the fuse is well below the yield strain of the fuse clip material. A fatigue aging effect on the fuse holder clips is not expected due to the additional 20 cycles of manipulation. The lack of excessive strain and the fact that the total number of cycles on the spring clips is very low, as compared to thousands of cycles expected for onset of low cycle fatigue, is the basis for the applicant's judgment.

The staff noted that NUREG 1801, Rev. 1, Item VI.A-8 identifies fatigue as one aging effect/mechanism for fuse holder metallic clamps due to manipulation. In addition, OE as discussed in NUREG-1760, Aging Assessment of Safety-Related Fuses Used in Low- and Medium-Voltage Applications in Nuclear Power Plants, documented OE with fuse holder failures due to fatigue. Removal and inserting of fuse elements could weaken fuse holder clips. These clips are made of copper alloy which have very low conductor strength. NUREG-1760 recommends that field inspections should include examination of fuse holders since these components account for a significant number of fuse failures due to loosening of the holder clips or electrical connections. It also recommends that maintenance procedures should be reviewed to minimize the removal and reinsertion of fuses to de-energize components since this can lead to degradation of the fuse holders. Fuses that must be removed and inserted for maintenance and surveillance should be included in periodic maintenance and inspection programs to monitor and control the effects of these repetitive activities on the fuse and fuse holder.

Furthermore, the GALL Report AMP XI.E5 recommends testing fuse holders to provide reasonable assurance that the component's intended function will be maintained within the CLB for the period of extended operation. The staff disagreed with the applicant that the fatigue aging effect on the fuse holder clips is not expected due to manipulation. Manipulation of fuse holders for maintenance could create a fatigue aging effect on fuse holder clips.

In response to the staff's concern, in a letter dated November 11, 2008, the applicant stated that twenty fuse boxes (containing only fuses and terminal blocks) were identified within the license renewal scope. Sixteen contain power and control fuses in the plant direct current (DC) power systems and four contain 6-amp fuses associated with the control room emergency lighting system. Of these twenty, none contain fuses that are pulled from their metallic clamps more than once per year. The applicant also stated that "an engineering evaluation concluded that" none of these specified fuse holders has a metallic clamp that will exhibit the aging mechanisms/ effects of fatigue and/or frequent manipulation listed in NUREG-1801, Item VI.A-8.

However, to ensure the aging effect of increased connection resistance due to fatigue of the fuse holder clamps is not occurring, SSES will implement a fuse holder program consistent with the recommendations of NUREG-1801, Section XI.E5.

The staff finds the applicant response acceptable because for fuse holders that the applicant periodically pulled fuse elements to de-energize circuits for preventive maintenance activities, the applicant will implement a fuse holder program consistent with the GALL Report AMP XI.E5. The staff evaluation of this program is SER Section 3.0.3. In a letter dated November 11, 2008, the applicant amended LRA Sections 3.6.2.1, 3.6.2.3.1, Table 3.6-1, 3.6.2.1, A1.2.51, A.1.4, B.2, and B.2.50 associated with fuse holder and to add fuse holder as a component type requiring aging management. The staff's concern about fatigue aging effect of fuse holders due to manipulation is resolved.

3.6.2.3.2 Tie Wraps

Tie wraps may be taken credit for in seismic analysis and in plant design specifications primary for separation to preclude ampacity degrading. OE has identified issues with tie wraps. Tie wraps were brittle, degraded, or missing and tie wraps failures affected safety functions of other system/components. The LRA does not discuss tie wraps as a commodity type requiring AMRs. In a letter dated July 3, 2008, the staff issued RAI 3.6-5 to request the applicant to explain why tie wraps do not require an AMR. In particular, the staff requested the applicant to address if tie wraps are taken credit for in seismic analysis in the current licensing basis and the effects of tie wraps for 10 CFR 54.4 (a)(2) over 10 CFR 54.4 (a)(1), non safety components whose failure could affect safety-functions.

In response to the staff's request, in a letter dated August 5, 2008, the applicant stated that a review of current licensing basis documentation revealed that SSES does not credit tie wraps in the seismic qualification of cable trays. SSES considered the potential effect on safety-related equipment caused by the failure of plastic cable tie-wraps due to age-related degradation and concluded that the failure of tie wraps that could prevent satisfactory accomplishment of the functions of structures, systems and components (SSCs) identified under 10 CFR 54.4(a)(1) is not credible for the following reasons:

- A review of the OE did not reveal any instances of equipment failures due to degradation of electrical cable tie wraps.

- Sensitive components that could be impacted by a loose tie wrap are installed within protective enclosures.

- SSES employs good housekeeping and foreign material exclusion (FME) practices.

The applicant also stated that reviews of SSES and industry OE did not reveal any occurrences of equipment failures caused by tie wraps outside of active components. Therefore, failure of tie wraps resulting in impact to safety functions is considered a hypothetical failure and based on current license renewal guidance does not need to be considered further for license renewal. The applicant further stated that based on a review of CLB documentation, including the UFSAR, Design Basis Documents, cable installation specifications, and design calculations, electric cable ties are not credited for spacing of cables at SSES. Cable ampacity ratings are based on cable tray fill, cable loading depth, cable diameters, and the number of conductors. Cables are assumed to be organized randomly in the tray and spacing between cables is not a consideration. Therefore, cable tie wraps are not credited in the SSES design for cable ampacity ratings.

The staff found the applicant's response acceptable. Because tie wraps are not credited for seismic analysis or design specifications at SSES, failures of tie wraps will not affect safety-related systems or components from perform their intended function. The applicant has reviewed its OE and did not identify any instances of equipment failures due to degradation of electrical cable tie wraps. Sensitive components that could be impacted by a loose tie wrap are installed within protective enclosures at SSES. The applicant employs good housekeeping and foreign material exclusion (FME) practices. Based on this information, the staff determines that the applicant correctly determined that tie wraps are not within the scope of license renewal.

3.6.3 Conclusion

The staff concludes that, the applicant has provided sufficient information to demonstrate that the effects of aging for the electrical and I&C components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.7 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." On the basis of its review of the AMR results and AMPs, the staff concludes that the applicant has demonstrated that the aging effects will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR supplement program summaries and concludes that the supplement adequately describes the AMPs credited for managing aging, as required by 10 CFR 54.21(d).

With regard to these matters, the staff concludes that there is reasonable assurance that the applicant will continue to conduct the activities authorized by the renewed licenses will continue to be conducted in accordance with the CLB, and any changes made to the CLB, in order to comply with 10 CFR 54.21(a)(3), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

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SECTION 4

TIME-LIMITED AGING ANALYSES

4.1 <u>Identification of Time-Limited Aging Analyses</u>

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, Pennsylvania Power & Light (PPL) Susquehanna, LLC (PPL or the applicant) addressed the TLAAs for Susquehanna Steam Electric Station (SSES), Units 1 and 2. SER Sections 4.2 through 4.8 documents the review of the TLAAs conducted by the staff of the United States (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 in compliance with 10 CFR 54.3.

In addition, pursuant to 10 CFR 54.21(c)(2), applicants must list existing plant-specific exemptions granted in accordance with 10 CFR 50.12, based on TLAAs. For any such exemptions, the applicant must evaluate and justify the continuation of the exemptions for the period of extended operation.

4.1.1 Summary of Technical Information in the Application

To identify the TLAAs, the applicant evaluated existing analyses and calculations for SSES against the six criteria specified in 10 CFR 54.3. The applicant indicated that it has identified the analyses and calculations that meet the six criteria by searching the current licensing basis (CLB). The CLB includes the updated final safety analysis report (UFSAR), engineering calculations, technical reports, engineering work requests, licensing correspondence, and applicable vendor reports. In LRA Table 4.1-1, “Time-Limited Aging Analyses,” the applicant listed the applicable TLAAs:

- reactor vessel (RV) neutron embrittlement
- metal fatigue
- environmental qualification (EQ) of electrical equipment
- containment liner plate, metal containments, and penetrations fatigue analyses
- main steamline (MSL) flow restrictor erosion analyses
- high-energy line break (HELB) cumulative fatigue usage factors
- core plate rim hold-down bolts

As required by 10 CFR 54.21(c)(2), the applicant must list all exemptions granted pursuant to 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 exemptions for the CLB that were dependent on and could change because of time-limited assumptions.

4.1.2 Staff Evaluation

In LRA Section 4.1, the applicant listed the TLAAs for SSES. 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 must meet the following six criteria:

(1) involve structures, systems, and components (SSCs) within the scope of license renewal, as described in 10 CFR 54.4(a)

(2) consider the effects of aging

(3) involve time-limited assumptions defined by the current operating term (40 years)

(4) are determined to be relevant by the applicant in making a safety determination

(5) involve conclusions, or provide the basis for conclusions, related to the capability of the system, structure, and component to perform its intended functions, as described in 10 CFR 54.4(b)

(6) are contained or incorporated by reference in the CLB

The applicant reviewed the list of common TLAAs in NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated September 2005. The applicant listed TLAAs applicable to SSES in LRA Table 4.1-1.

The staff confirmed that the applicant's LRA includes the TLAAs that are normally applicable to boiling-water reactor (BWR) applications, including:

- TLAAs on neutron irradiation embrittlement: upper shelf energy (USE), adjusted reference temperature, pressure temperature (P-T) limits, RV circumferential weld probability of failure analyses, RV axial weld probability of failure analyses, and RV reflood analyses.

- TLAAs on metal fatigue of American Society of Mechanical Engineers (ASME) Code Class 1 components (RV, RV internals, and Class 1 piping components), metal fatigue of non-Class 1 components, and environmentally assisted fatigue.

- TLAAs on environmental qualification of electrical equipment.

- TLAAs on metal fatigue of the containment liner and containment penetrations, including ASME MC structures, downcomer vents and safety/ relief valve (SRV) discharge piping, and SRV quenchers.

The staff finds the applicant's identification of these TLAAs acceptable because they are consistent with the TLAAs identified in SRP-LR Sections 4.2, 4.3, 4.4, and 4.6 as being applicable to BWR LRAs.

The staff also verified that the LRA included the following additional plant-specific TLAAs:

- MSL Flow Restrictor Erosion Analyses
- HELB Metal Fatigue Analysis
- Core Plate Rim Hold-down Bolt Stress Relaxation Analysis

The staff confirmed that applicant's identification of these additional TLAAs satisfies the recommendation in SRP-LR Section 4.7 that the applicant identify any additional analyses for the facilities that meet the definition of a TLAA, in accordance with the requirements of 10 CFR 54.3. The staff did not identify any omissions of TLAA for this LRA.

The staff noted that the LRA indicates the TLAA on containment prestressed tendons discussed in SRP-LR Section 4.5 is not applicable to the LRA. The staff confirmed that the design of SSES Units 1 and 2 do not include containment structures designed with pre-stressed tendons. Therefore, based on this confirmation, the staff concludes that the applicant has provided a basis for concluding that the TLAA on prestressed containment tendons is not applicable to the LRA because the SSES containment designs do not include these design features.

Based on its review, the staff concludes that the applicant has satisfied the requirements of 10 CFR 54.3 to identify the TLAAs that are applicable the LRA because the applicant has satisfied the TLAA identification guidance and recommendations in SRP-LR Sections 4.2, 4.3, 4.4, 4.6, and 4.7, and because the applicant has provided any acceptable basis for concluding that the guidance in SRP-LR Section 4.5, on TLAAs for prestressed concrete tendons, is not applicable to the LRA.

Pursuant to 10 CFR 54.21(c)(1), each TLAA for an application must be found acceptable for the period of extended operation, in accordance with one of the following acceptance criteria:

(i) the analysis remains valid for the period of extended operation

(ii) the analysis has been projected to the end of the period of extended operation

(iii) the effects of aging of the intended function will be managed for the period of extended operation

The staff confirmed that the TLAAs identified by the applicant as being applicable to the LRA all have been evaluated by the applicant against the provisions and criteria of 10 CFR 54.21(c)(1). The staff evaluates these TLAAs and provides its bases for accepting them, in accordance with 10 CFR 54.21(c)(1)(i), (ii), or (iii), in the staff evaluations provided in SER Sections 4.2, 4.3, 4.4, 4.6, or 4.7.

In request for additional information (RAI) 4.1.3-1, the staff requested that the applicant clarify whether the following exemptions granted to PPL in lieu of meeting the fracture toughness requirements of 10 CFR Part 50, Appendix G, and that were granted under the requirements of 10 CFR 50.60(b) and the exemption approval criteria pursuant to 10 CFR 50.12, should be identified as exemptions based on the time-limited assumptions, as required by 10 CFR 54.21(c)(2):

(1) The exemption in Paragraph 2E of Operating License NPF-14 for Unit 1.

(2) The exemption granted in the staff letter of February 7, 2002, from D. S. Collins (NRC) to R. G. Byram (PPL), granting PPL an exemption to use methods of ASME Code Case N-640 in the generation of the P-T limits for Units 1 and 2.

In its response to RAI 4.1.3-1, dated June 12, 2007, the applicant clarified that the exemption granted in Operating License NPF-14, Paragraph 2E for Unit 1 is based on the methods for calculating the initial Upper Shelf Energy (USE) and reference nil-ductility temperature (RT_{NDT}) values, pursuant to 10 CFR Part 50, Appendix G required USE and P-T limit calculations, and that these values are based on TLAAs. The staff noted that in NUREG-0800, Chapter 3.5.2, NRC Branch Position EMCB 5-2 states that the initial USE and initial RT_{NDT} values used in USE and P-T limit calculations are established from either drop weight or Charpy-V notch tests performed on unirradiated RPV material impact test specimens, and are not dependent upon the influence of these values to an accumulated neutron irradiation time-limited parameter. Thus, based on this assessment, the staff finds that the applicant has provided an acceptable basis for concluding that the exemption mentioned in Operating License NPF-14, Paragraph 2E, for Unit 1, is not based on a TLAA.

The applicant also clarified that the alternative P-T limit calculation methods discussed in ASME Code Case N-640 have been approved by the staff in the latest version of Regulatory Guide (RG) 1.147 and endorsed by reference in 10 CFR 50.55a. Thus, the exemption to use this code case is no longer necessary and will not be needed for the period of extended operation. The staff confirms the staff endorsed ASME Code Case N-640 for use in RG 1.147, Revision 15. Based on this confirmation, the staff concludes that the exemption to use ASME Code Case N-640 is no longer required and need not be identified as an applicable exemption for the LRA based on a TLAA because: (a) the staff has endorsed the code case for use in RG 1.147, Revision 15 and (b) the applicant may use the Code for the 10-year inservice inspection (ISI) intervals for the period of extended operation. The applicant may use the Code without receiving prior staff approval, if it identifies this code case for use when updating the ASME Code Section XI edition of record, 12 months prior to entering into these 10-year ISI intervals.

Based on its review, as discussed above, the staff finds the applicant’s response to RAI 4.1.3-1 acceptable. Therefore, the staff’s concern described in RAI 4.1.3-1 is resolved.

Based on the information provided by the applicant as to the process it used to identify these exemptions and its results, the staff concludes, in accordance with 10 CFR 54.21(c)(2), that there are no TLAA-based exemptions that the applicant must justify prior to entering into and continuing 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 confirms, 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

“Neutron embrittlement” is the term for changes in mechanical properties of RV materials caused by exposure to fast neutron flux (E>1.0 MeV) within the vicinity of the reactor core, called the beltline region. The most pronounced material change is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material’s resistance to cleavage and ductile fracture decreases. Fracture toughness also depends on temperature. The RT_{NDT}, above which the material behaves in a ductile manner and below which the material behaves in a brittle manner, increases as fluence increases and requires higher temperatures for continued ductility. Regulations governing RV integrity are found in 10 CFR Part 50. Specifically, 10 CFR 50.60 requires all light-water reactors to meet the fracture toughness, P-T limits, and material surveillance program requirements for the reactor coolant pressure boundary (RCPB) pursuant to 10 CFR Part 50 Appendices G and H.

The CLB analyses evaluating reduction of fracture toughness of the reactor pressure vessel (RPV) for 40 years are TLAAs. Neutron fluence, USE, adjusted reference temperature, and vessel P-T limits are time-dependent items that must be investigated to evaluate vessel embrittlement (*i.e.*, fracture toughness of vessel materials). The following sections address fluence, USE, adjusted reference temperature, P-T limits, circumferential welds, and axial welds for RPV beltline materials for the period of extended operation.

4.2.1 Neutron Fluence

4.2.1.1 Summary of Technical Information in the Application

LRA Section 4.2.1 summarizes the evaluation of neutron fluence for the period of extended operation. To evaluate the effects of radiation on RPV material embrittlement, analyses determined neutron fluence for extended power uprate conditions and for extended operation out to 54 effective full-power years (EFPY) (*i.e.*, at the end of 60 years operation). Using actual reactor core power histories to date and conservative estimates of future core designs for each unit, extended operation to 60 years will be bounded by 54 EFPY. High energy (>1 MeV) neutron fluence for the RPV beltline region welds and shells was calculated by the Radiation Analysis Modeling Application fluence methodology developed for the Electric Power Research Institute (EPRI) and the Boiling Water Reactor Vessel and Internals Project (BWRVIP). Use of this methodology for evaluations of fluence was in accordance with guidelines presented in Regulatory Guide (RG) 1.190, as recommended in SRP-LR Section 4. The staff has reviewed and approved Radiation Analysis Modeling Application for BWR RPV fluence predictions and concluded that the Radiation Analysis Modeling Application methodology applies to SSES. Fluence was calculated at the inner surface (0-T) of the vessel wall, at one-quarter (1/4-T) and three-quarters (3/4-T) of the vessel wall thickness.

NUREG-1801 (The Generic Aging Lessons Learned (GALL) Report) indicates that ferritic materials for RPV beltline shells, welds, and assembly components must be evaluated for neutron irradiation embrittlement, if high-energy neutron fluence is greater than a threshold value of 1.0E+17 n/cm^2 (0-T location) at the end of the license renewal term. RPV shell courses #1 and #2 and axial welds in these shell courses will experience neutron fluence greater than the threshold value prior to the end of 54 EFPYs of operation. The circumferential weld between shell courses #1 and #2 also will be exposed to neutron fluence exceeding the threshold value during the extended lives of the plants. Shell course #3 and its welds will not experience neutron fluence exceeding the threshold value during the extended lives of the plants. The only RPV assembly items other than the shells and welds likely to experience neutron fluence greater than 1.0E+17 n/cm^2, during the period of extended operation, would be instrumentation nozzles N16A and N16B. These nozzles are fabricated from Inconel SB-166, a non-ferritic material which is not a limiting material in the vessel beltline region; therefore, nozzles N16A and N16B are not subject to 10 CFR Part 50, Appendix G evaluation requirements for irradiation effects. Within the beltline region, only shell courses #1 and #2, their axial welds, and the circumferential weld between shell courses # 1 and #2, require evaluation for neutron embrittlement for the period of extended operation.

4.2.1.2 Staff Evaluation

On four BWRVIP reports related to Radiation Analysis Modeling Application fluence methodology, in the SER dated May 13, 2005, the staff approved use of Radiation Analysis Modeling Application code for BWR RPV fluence predictions and concluded that the Radiation Analysis Modeling Application methodology applies to SSES. The applicant provided fluence values based on the Radiation Analysis Modeling Application methodology for the SSES RPV beltline materials in LRA Section 4.2.1. These fluence values were used throughout LRA

Section 4.2 for the RPV neutron embrittlement calculations. The staff confirmed that Units 1 and 2 are BWR-4 plants and their fluence values were calculated in accordance with the guidance of RG 1.190, with no bias in the calculations. Therefore, the staff finds the applicant's fluence values acceptable.

4.2.1.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of neutron fluence in LRA Section A.1.3.1. On the basis of its review of the UFSAR supplement, the staff finds the summary description of the applicant's actions to address neutron fluence is adequate.

4.2.1.4 Conclusion

On the basis of its review, the staff concludes that the fluence values for the SSES RPV beltline materials in LRA Section 4.2.1 are acceptable for use for the RPV neutron embrittlement calculations, throughout LRA Section 4.2. 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) and; therefore, is acceptable.

4.2.2 Upper Shelf Energy Evaluation

4.2.2.1 Summary of Technical Information in the Application

LRA Section 4.2.2 summarizes the evaluation of USE values for the period of extended operation. Part 50 of 10 CFR, Appendix G requires that USE values for RPV materials include the effects of neutron radiation and that USE for the beltline materials including plates and welds be maintained at no less than 50 ft-lb for the life of the RV. Calculated neutron fluence values considering both the units' extended power uprate and extended operation to 54 EFPY exceed previously-determined neutron fluence values based on materials surveillance program information for SSES Units 1 and 2. Therefore, projected changes in USE values for the period of extended operation are required in accordance with 10 CFR Part 50, Appendix G. The projected USE values at the end of 54 EFPY for the RPV beltline plates and welds for SSES, Units 1 and 2 were determined in accordance with RG 1.99, Revision 2. For plates and welds that do not meet the 50 ft-lb criterion, an equivalent-margins analysis documented in BWRVIP-74-A, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal," was used instead to evaluate the acceptability of the low USE RPV materials. The results of this evaluation demonstrated that all SSES, Units 1 and 2 plates and welds that do not meet the 50 ft-lb criterion are bounded by the BWRVIP-74-A equivalent margins analysis. Therefore, the applicant concluded that the effects of neutron radiation have been evaluated appropriately, and all RPV beltline materials for SSES, Units 1 and 2 have been demonstrated to remain in compliance with Appendix G of 10 CFR Part 50 for 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.

According to RG 1.99, Revision 2, the predicted decrease in USE values due to neutron embrittlement during plant operation is dependent upon the amount of copper in the material and the predicted neutron fluence for the material. This RG recommends a minimum of two credible data points for the use of surveillance data in the embrittlement evaluation. RG Position 1.2 specifies methods for calculating the predicted decrease in USE values for materials that do not have sufficient credible surveillance data. Since each RPV for Units 1 and 2 has only one set of surveillance data, the applicant used RG 1.99, Revision 2, Position 1.2, for calculating the predicted USE decreases for each of the beltline welds and plates for the extended period of operation.

For a conventional USE evaluation, the initial USE value is needed in addition to the USE decrease, to calculate the USE value at 54 EFPY for a RPV material. LRA Tables 4.2-3 and 4.2-5, which the applicant completely revised in its RAI response dated June 9, 2008, provide initial USE values for all Units 1 and 2 RPV beltline materials. This information is consistent with that in the staff's Reactor Vessel Integrity Database (RVID), with two exceptions: (1) the RVID does not record initial USE values for Units 1 and 2 beltline materials having predicted 32 EFPY USE values lower than 50 ft-lb, and (2) the initial USE values for Unit 1 weld Nos. 2 and 5 reported in the revised LRA Table 4.2-3 are 109 ft-lb, while the corresponding values in the RVID are 126 ft-lb and 134 ft-lb, respectively. The staff found that although the RVID values of 126 ft-lb and 134 ft-lb for weld Nos. 2 and 5 are consistent with those in a Surveillance Report Table 7-4, dated May 19, 1994, and Attachment 2 to the applicant's response to GL 92-01, Revision 1, dated June 23, 1994, the Charpy impact energy plots from the May 19, 1994 surveillance report clearly indicated an initial USE value of 109 ft-lb for these welds. Different initial USE values also exist between revised LRA Table 4.2-5 and the RVID for Unit 2 weld Nos. 5 and 7. The staff evaluated the discrepancies and concluded that the applicant's revised LRA Tables 4.2-3 and 4.2-5 represent the most accurate information as to initial USE values for the Units 1 and 2 RPVs. Therefore, the applicant's revised LRA Tables 4.2-3 and 4.2-5 represent the most accurate information as to initial USE values for the Units 1 and 2 RPVs. Based on these initial USE values, the applicant used RG 1.99, Revision 2 to calculate the percent USE decrease and the 54 EFPY USE values at the 1/4-T location for all Units 1 and 2 RPV beltline materials and presented the results in revised LRA Tables 4.2-3 and 4.2-5. The staff performed an independent evaluation and confirmed the applicant's 54 EFPY USE values for all RPV beltline materials. Thus, pursuant to 10 CFR 54.21(c)(1)(ii), the staff finds that the Units 1 and 2 RPV beltline materials which have 54 EFPY USE values at 1/4-T greater than 50 ft-lb (see revised LRA Tables 4.2-3 and 4.2-5) meet the 10 CFR Part 50, Appendix G USE requirement to the end of the period of extended operation.

The BWR Owners Group prepared an equivalent margins analysis in Topical Report BWRVIP-74-A, to demonstrate that lower values of USE will provide margins of safety against fracture equivalent to those required by ASME Code Section XI, Appendix G. The equivalent margins analysis from BWRVIP-74-A utilized the technique originally developed in GE Topical Report NEDO-33205-A, "10 CFR Part 50, Appendix G, Equivalent Margin Analysis for Low Upper Shelf Energy in BWR/2 through BWR/6 Vessels," Revision 1, February 1994. The staff reviewed and accepted BWRVIP-74-A, as documented in the staff's SER dated October 18, 2001. Consequently, a plant without initial USE data or having a projected USE value lower than 50 ft-lb may reference BWRVIP-74-A to confirm that equivalent margins of safety against failure are maintained for its RPV beltline welds or plates by demonstrating that the percent USE decrease in each weld or plate is less than the allowable USE decrease for welds or plates established in BWRVIP-74-A.

For the RPV beltline materials in LRA Tables 4.2-3 and 4.2-5 that do not meet the 50 ft-lb criterion through the end of the period of extended operation, the applicant performed equivalent margins analysis evaluations and summarized the results in revised LRA Tables 4.2-

4 and 4.2-6. The staff confirms that the BWRVIP-74-A equivalent margins analysis was appropriately applied and the percent USE decreases for the RPV materials that did not meet the 50 ft-lb criterion are less than the allowable USE decrease established in BWRVIP-74-A for RPV welds and plates. Therefore, pursuant to 10 CFR 54.21(c)(1)(ii), the staff finds the Units 1 and 2 RPV beltline materials which have 54 EFPY USE values at the 1/4-T location less than 50 ft-lb (see revised LRA Tables 4.2-3 and 4.2-5) also meet the 10 CFR Part 50, Appendix G USE requirement to the end of the period of extended operation.

4.2.2.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of USE in revised LRA Section A.1.3.1.2, LRA amendments, and LRA responses dated November 25, 2008. On the basis of its review of the UFSAR supplement, the staff finds the summary description of the applicant's actions to address USE is adequate.

4.2.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for the Units 1 and 2 RPV beltline materials which have 54 EFPY USE values at the 1/4-T location less than 50 ft-lb (see revised LRA Tables 4.2-3 and 4.2-5) also meet the 10 CFR Part 50, Appendix G USE requirement 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) and, therefore, is acceptable.

4.2.3 Adjusted Reference Temperature Analysis

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3 summarizes the evaluation of adjusted reference temperature for the period of extended operation. In addition to USE, the key parameter which characterizes the fracture toughness of a material is RT_{NDT}, which changes as its exposure to neutron radiation increases. The effects of neutron radiation on RT_{NDT} are reflected in this reference temperature change (ΔRT_{NDT}), and the resulting adjusted reference temperature. Adjusted reference temperature, is calculated by adding ΔRT_{NDT} to RT_{NDT} with appropriate margin for uncertainties. The methodology for calculating adjusted reference temperature for the vessel beltline plates and welds is in RG 1.99, Revision 2. Material properties and initial RT_{NDT} values were from analyses of RV surveillance materials. The applicant reviewed data from the staff RVID and the BWRVIP Integrated Surveillance Program and used the highest limiting material property values in computations of ΔRT_{NDT} and adjusted reference temperature for conservative results.

4.2.3.2 Staff Evaluation

The staff reviewed LRA Section 4.2.3 to verify, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The applicant calculated the adjusted reference temperature values based on the 54 EFPY fluences for the Units 1 and 2 RPV beltline materials. The applicant described the results, which the staff accepts and are discussed in SER Section 4.2.1, in LRA Tables 4.2-1 and 4.2-2.

In reviewing the adjusted reference temperature values and the key parameters for their determination, as described in LRA Tables 4.2-7 and 4.2-8, the staff found that the applicant's chemistry data and initial RT_{NDT} values are identical to those established in the staff's RVID for the Units 1 and 2 RPV beltline materials. The staff independently reviewed all adjusted reference temperature calculations in LRA Tables 4.2-7 and 4.2-8, based on the approved chemistry and fluence data, and determined that the applicant has appropriately followed the guidance of RG 1.99, Revision 2 in determining the projected 54 EFPY adjusted reference temperature values for the Units 1 and 2 RPV beltline materials. The staff's 54 EFPY adjusted reference temperature value for the Unit 1 limiting material, the lower intermediate shell with heat number C0776-1 is 71.5 °F, as opposed to the applicant's 72.4 °F. The staff's 54 EFPY adjusted reference temperature value for the Unit 2 limiting material, the lower intermediate shell with heat number C2421-3 is 61.9 °F, as opposed to the applicant's 62.4 °F. The applicant's adjusted reference temperature values are more conservative than the staff's values. LRA Section 4.2.3 further states, "[i]t may be noted that adjusted reference temperature values are well below the 200 °F suggested in Section 3 of Regulatory Guide 1.99 and are, thus, acceptable for the period of extended operation." It should be noted that there are no criteria, pursuant to 10 CFR Part 50, for accepting RPV adjusted reference temperatures. The significance of adjusted reference temperatures is evaluated indirectly in another TLAA, in LRA Section 4.2.4, "Pressure-Temperature (P-T) Limits."

In RAI 4.2.3-1, the staff requested that the applicant revise LRA Section 4.2.4 and its associated UFSAR supplement summary description by removing the quoted statement: "[i]t may be noted that adjusted reference temperature values are well below the 200 °F suggested in Section 3 of Regulatory Guide 1.99 and are, thus, acceptable for the period of extended operation."

In its response to RAI 4.2.3-1, dated October 18, 2007, the applicant made the appropriate revision.

Based on its review, the staff finds the applicant's response to RAI 4.2.3-1 acceptable because the applicant has appropriately revised the LRA to remove the quote. Therefore, the staff's concern described in RAI 4.2.3-1 is resolved.

4.2.3.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of adjusted reference temperature in LRA Section A.1.3.1. On the basis of its review of the revised UFSAR supplement, the staff finds that the summary description of the applicant's actions to address adjusted reference temperature is adequate.

4.2.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for adjusted reference temperature, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

4.2.4 Pressure-Temperature (P-T) Limits

4.2.4.1 Summary of Technical Information in the Application

LRA Section 4.2.4 summarizes the evaluation of P-T limits for the period of extended operation.

To assure that adequate margins of safety are maintained for various modes of reactor operation, 10 CFR Part 50, Appendix G specifies material P-T requirements for the service life of the RV. The basis for these fracture toughness requirements is in ASME Code Section XI, Appendix G. The ASME Code requires P-T limits for hydrostatic pressure tests and leak tests, for operation with the core not critical during heatup and cool-down, and for core critical operation. Calculations were performed to develop P-T limit curves for Units 1 and 2 for 54 EFPY, but were not submitted as part of the application. The calculations, which were for the bounding regions of the RV, account for the 54 EFPY fluence projections, include the effects of extended power uprate conditions.

The P-T curves were developed in accordance with 10 CFR Part 50, Appendix G and the methods of ASME Code Section XI, Appendix G, 1998 Edition, including the 2000 Addenda.

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 current P-T limits were approved by the staff on March 30, 2006. These P-T limits are valid for 35.7 EFPY for Unit 1 (Amendment 232) and 30.2 EFPY for Unit 2 (Amendment 209). LRA Section 4.2.4 states that calculations were performed to develop P-T limits in accordance with 10 CFR Part 50, Appendix G and ASME Code Section XI, Appendix G, 1998 Edition, including the 2000 Addenda, for both Units for the extended period of operation, using the 54 EFPY fluence values discussed in LRA Section 4.2.1. However, since the LRA did not include, for staff review, the revised P-T limits valid for 54 EFPY, the staff determined that it is inappropriate for the applicant to state in LRA Section 4.2.4 that, "[t]he 54 EFPY P-T curves for Units 1 and 2 demonstrate that there is sufficient operating margin for hydrostatic tests, heatup, cooldown, and core critical operation to the end of the period of extended operation."

In RAI 4.2.4-1, the staff requested that the applicant revise LRA Section 4.2.4 and its associated UFSAR supplement summary description, replacing the statement above with a clarification that the applicant will submit P-T limit updates to the staff, in compliance with 10 CFR Part 50, Appendix G. The request will change this section of the LRA to comply with 10 CFR 54.21 (c)(1) (iii) instead of 10 CFR 54.21 (c)(1) (ii).

In its response to RAI 2.4-1, dated October 18, 2007, the applicant amended LRA Section 4.2.4 to reflect the change requested by the staff.

Based on its review, the staff finds the applicant's response to RAI 2.4-1 acceptable because the applicant has appropriately revised the LRA to clarify that it will submit P-T limit updates to the staff, in compliance with 10 CFR Part 50, Appendix G. therefore, the staff's concern described in RAI 4.2-1 is resolved.

The staff confirms that the applicant's 54 EFPY P-T limits, valid for the period of extended operation, is in accordance with 10 CFR 54.21(c)(1)(ii). The staff does not require that the applicant submit these P-T limit curves as part of the LRA for this TLAA. However, the staff determines that the applicant is required to submit revised P-T limits (not necessarily the 54 EFPY P-T limits) in accordance with 10 CFR Part 50, Appendix G, prior to the expiration of the facility's current P-T limit curves, allowing adequate time for staff review and approval. Therefore, the staff finds that the applicant's plan to manage the P-T limits in accordance with 10 CFR 54.21(c)(1)(iii) is acceptable, because the applicant will implement changes to the P-T limit curves through the license amendment process (*i.e.*, through revision of the plant Technical Specifications) and; thus, meet the requirements of 10 CFR 50.60 and 10 CFR Part 50, Appendix G.

4.2.4.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of P-T limits in LRA Section A.1.3.1.

On the basis of its review of the revised UFSAR supplement, the staff finds the summary description of the applicant's actions to address P-T limits is adequate.

4.2.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for P-T limits, the effects of aging on the intended function 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) and; therefore, is acceptable.

4.2.5 Reactor Vessel Circumferential Weld Examination Relief

4.2.5.1 Summary of Technical Information in the *Application*

LRA Section 4.2.5 summarizes the evaluation of RV circumferential weld examination relief for the period of extended operation. BWRVIP-74-A reiterates the BWRVIP-05 recommendation that RPV circumferential welds may be exempted from examination. The NRC BWRVIP-74-A SER agreed, but required plants to request relief individually. The relief request should demonstrate that at the expiration of the current license the circumferential welds satisfy the BWRVIP-05 limiting conditional failure probability evaluation. This evaluation of circumferential weld parameters is a TLAA. The applicant requested relief from circumferential vessel shell weld volumetric examinations in November 2000. The relief request was granted in February 2001. The submittal included an analysis showing the RV parameters at 32 EFPY within the bounding parameters for Chicago Bridge & Iron (CB&I) vessels from the BWRVIP-05 SER dated July 28, 1998, and with a lower conditional probability of failure for circumferential welds than that stated in the BWRVIP-05 SER. The RPV circumferential weld parameters at 54 EFPY will remain within the bounding parameters for CB&I vessels at 64 EFPY from the BWRVIP-05 SER and the conditional probability of failure for circumferential welds remains below that stated in the BWRVIP-05 SER. The applicant's process for a relief request for circumferential vessel shell weld volumetric examinations prior to the period of extended operation will be the same as during the original licensing period.

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 technical basis for relief from the ASME Code, Section XI circumferential weld ISI requirements is discussed in the BWRVIP-05 SER. In the BWRVIP-05 SER, the staff concluded that since the failure frequency for circumferential welds in BWR plants is significantly below the criterion specified in RG 1.154, "Format and Content of Plant-Specific Pressurized Thermal

Shock Safety Analysis Reports for Pressurized Water Reactors," and below the core damage frequency of any BWR plant, the failure frequency for RPV circumferential welds is sufficiently low to justify elimination of ISI. The BWRVIP-05 SER indicated that BWR applicants may request relief from the ISI requirements of 10 CFR 50.55a(g) for volumetric examination of RPV circumferential 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 BWRVIP-05 SER, and (2) the applicant has implemented operator training and established procedures that limit the frequency of cold over-pressure events to the frequency specified in the BWRVIP-05 SER. The letter indicated that the requirements for inspection of RPV circumferential welds during an additional 20-year license renewal period require reassessment, on a plant-specific basis, as part of any BWR LRA. In addition, the applicant must request relief from the ISI requirements for volumetric examination of circumferential welds for the extended license term, in accordance with the requirements of 10 CFR 50.55a(g).

BWRVIP-74 Section A.4.5 indicates that the BWRVIP-05 SER conservatively evaluated the BWR RPVs to 64 EFPY, which is 10 EFPY greater than what is realistically expected for the end of the license renewal period. BWRVIP-74 Section A.4.5 also indicates that to obtain relief from the ASME Code specified ISI requirements on RPV circumferential welds, each licensee will submit a plant-specific relief request demonstrating that the two BWRVIP-05 SER conditions are satisfied for the period of extended operation. But, BWRVIP-74 Section A.4.5 provides no guidance about the information that should be included in an LRA. Since meeting the first BWRVIP-74 Section A.4.5 condition for a plant-specific relief request (*i.e.*, the first BWERVIP-05 SER condition for the extended period of operation) requires a TLAA, the staff determined that this TLAA information should be included in the LRA. The staff used the mean RT_{NDT} value to evaluate the failure probability of BWR circumferential welds at 32 and 64 EFPY in the BWRVIP-05 SER. The neutron fluence used in this evaluation was the neutron fluence at the RPV inner diameter clad-weld interface.

Although LRA Section 4.2.5 does not provide a comparison of the applicant's plant-specific information with the generic analysis information in the BWRVIP-05 SER to support its conclusion that the Units 1 and 2 RPV beltline circumferential weld parameters at 54 EFPY remain within the bounding parameters for CB&I RPVs at 64 EFPY from the BWRVIP-05 SER, the essential plant-specific information needed for this comparison is available in LRA Section 4.2.3. As a result, the staff performed a comparison in its evaluation. The staff notes LRA Tables 4.2-7 and 4.2-8 show that the initial RT_{NDT} and ΔRT_{NDT} for the limiting circumferential weld for Unit 2 at 54 EFPY (with heat No. 624263/E204A27A) are -20 °F and 30.9 °F, resulting in a mean RT_{NDT} (without the margin term) of 10.9 °F. The corresponding Unit 1 mean RT_{NDT} is -29.7 °F. The mean RT_{NDT} from the BWRVIP-05 SER generic analysis for CB&I RPV circumferential weld at 64 EFPY is 70.6 °F. Since the 54 EFPY mean RT_{NDT} value for either Unit 1 or Unit 2 is less than the 64 EFPY value from the BWRVIP-05 SER, the staff concludes that the RPV conditional failure probability for either unit at 54 EFPY is bounded by the staff's generic analysis in the BWRVIP-05 SER. The staff also confirms that the copper and nickel, chemistry factor, and initial RT_{NDT} for the limiting weld for both units are consistent with those in the staff's RVID. Therefore, the staff determines that the applicant's RPV circumferential welds satisfy the limiting conditional failure probability for circumferential welds at the end of the period of extended operation (the first condition established in the BWRVIP-05 SER).

For the relief request mentioned in LRA Section 4.2.5, the staff reviewed and accepted the applicant's implementation of operator training and establishment of procedures, limiting the frequency of cold over-pressure events to the frequency specified in the BWRVIP-05 SER, for the remaining licensed period of operation described in the 2001 SER. Further, the applicant stated in LRA Section 4.2.5, "PPL will process a relief request for circumferential vessel shell weld volumetric examinations prior to the period of extended operation in the same manner that has been the practice during the original licensing period." With this commitment, the staff determines that continued implementation of operator training and establishment of procedures limiting the frequency of cold over-pressure events will be satisfied during the period of extended operation (the second condition established in the BWRVIP-05 SER). The staff determines that this condition concerns specific plant operation procedures, and is not considered a TLAA.

In the BWRVIP-05 SER, the staff concluded that the applicant need not examine the RPV circumferential shell welds, if the corresponding volumetric examinations of the RPV axial shell welds revealed the presence of an age-related degradation mechanism.

In RAI 4.2.5-1, dated September 5, 2007, the staff requested that the applicant confirm whether previous volumetric examinations of the RPV axial shell welds have shown any indication of cracking or other age-related degradation mechanisms in the welds.

In its response to RAI 4.2.5-1, dated October 18, 2007, the applicant verified that previous examinations of the Susquehanna RPV axial shell welds have not identified any relevant indications or other age-related degradation mechanisms in the welds.

Based on its review, the staff finds the applicant's response to RAI 4.2.5-1 acceptable because the applicant has verified that no relevant indications or other age-related degradation mechanisms in the welds were identified as a result of its previous examinations of the axial welds at Units 1 and 2. Therefore, the staff's concern described in RAI 4.2.5-1 is resolved.

The staff finds the applicant's conclusion for this TLAA acceptable because the staff's evaluation, based on the LRA Sections 4.2.3 and 4.2.5 information, indicates that the 54 EFPY conditional failure probability for the RPV circumferential welds for Units 1 and 2 is bounded by the staff analysis in the BWRVIP-05 SER, and because the applicant will submit a relief request addressing the continued use of procedures and training to limit cold over-pressure events during the period of extended operation, prior to the period of extended operation.

4.2.5.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of RV circumferential weld examination relief in LRA Section A.1.3.1. On the basis of its review of the UFSAR supplement, the staff finds the summary description of the applicant's actions to address RV circumferential weld examination relief is adequate.

4.2.5.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for RV circumferential weld examination 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) and; therefore, is acceptable.

4.2.6 Reactor Vessel Axial Weld Failure Probability

4.2.6.1 Summary of Technical Information in the Application

LRA Section 4.2.6 summarizes the evaluation of RV axial weld failure probability for the period of extended operation. The SER for BWRVIP-74-A evaluated the failure frequency of BWR RPV axially-oriented welds and determined it to be below 5.0E-06 per reactor year for 40 years of reactor operation. Applicants for license renewal must evaluate axially-oriented RPV welds to show that their failure frequency remains below the 5.0E-06 calculated in the BWRVIP-74 SER. The SER states that an acceptable justification is that the limiting axial beltline weld mean-RT_{NDT} at the end of the period of extended operation is less than the values specified in the SER. The axial weld mean-RT_{NDT} at 54 EFPY is projected to be well below that in the SER, and thus the axial weld failure frequency is well below the acceptable limit of 5.0E-06.

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.

In the BWRVIP-05 SER, the staff identified a concern regarding the failure frequency of axial welds in BWR RPVs. In response to this concern, the BWRVIP supplied evaluations of axial weld failure frequency in letters dated December 15, 1998, and November 12, 1999. The staff's BWRVIP-05 supplemental SER on these analyses was issued on March 7, 2000. As discussed in the BWRVIP-05 supplemental SER, the staff performed a generic analysis using the Clinton RPV (a CB&I vessel) and established that a mean axial weld RT_{NDT} of 91 °F would result in a RPV failure frequency of 2.73×10^{-6}, per reactor-year of operation. This information was repeated in the BWRVIP-74-A SER.

The staff notes that LRA Section 4.2.6 does not provide a comparison of SSES plant-specific information with the Clinton RPV information stated above to support the applicant's conclusion that the Units 1 and 2 RPV beltline axial weld mean-RT_{NDT} at 54 EFPY is projected to be well below that in the BWRVIP-74-A SER. However, since the applicant provided essential plant-specific information needed for this comparison in LRA Section 4.2.3, the staff performed a comparison in its evaluation. Based on LRA Tables 4.2-7 and 4.2-8, the staff finds the mean-RT_{NDT} for the most limiting axial and circumferential weld for both units at 54 EFPY is 10.9 °F, less than the mean-RT_{NDT} of 91 °F from the BWRVIP-74-A SER.

The staff determines that this comparison supports its conclusion that the failure frequency for the SSES RPV axial welds will be far less than 5×10^{-6} per reactor-year of operation at the end of the period of extended operation. Therefore, the conclusion in LRA Section 4.2.6 is acceptable.

4.2.6.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of RV axial weld failure probability in LRA Section A.1.3.1. On the basis of its review of the UFSAR supplement, the staff finds that the summary description of the applicant's actions to address RV axial weld failure probability is adequate.

4.2.6.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for RV axial weld failure probability, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

4.2.7 Reflood Thermal Shock

4.2.7.1 Summary of Technical Information in the Application

LRA Section 4.2.7 summarizes the evaluation of reflood thermal shock for the period of extended operation. The UFSAR Section 3.13.1 documents a concern of possible brittle fracture of the RV from reflooding following a postulated loss-of-coolant accident (LOCA). This concern is addressed in NEDO-10029, "An Analytical Study on Brittle Fracture of GE-BWR Vessels Subject to the Design Basis Accident", in which a very conservative analysis sets an upper limit on brittle fracture failure for the materials and concludes that catastrophic failure is not possible. The NEDO-10029 analysis assumes a neutron fluence of 1E+18 neutrons per square centimeter (n/cm^2) throughout the vessel with a corresponding shift in the RT_{NDT} of 50 °F. For SSES, the predicted maximum fluence at 1/4-T vessel wall thickness at 54 EFPY is 9.48E+17 n/cm^2 for Unit 1 and 9.54E+17 n/cm^2 for Unit 2 with an RT_{NDT} shift of 35.9 °F for Unit 1 and 38.4 °F for Unit 2. Therefore, as the 54 EFPY values are bounded by the values assumed in the NEDO-10029 analysis, the analysis remains valid for the period of extended operation.

4.2.7.2 Staff Evaluation

The staff reviewed LRA Section 4.2.7 to verify, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

<u>RPV</u>. In LRA Section 4.2.7, the applicant stated that the SSES RPVs are bounded by the NEDO-10029 analysis, because the RT_{NDT} shifts at 54 EFPY (35.9 °F for Unit 1 and 38.4 °F for Unit 2) are less than the RT_{NDT} shift of 50 °F used in the NEDO-10029 analysis. The staff determined that the applicant's assessment is not complete, because the fracture toughness of the RPV material is determined by the RPV operating temperature and the RT_{NDT} value (*i.e.*, the sum of the initial RT_{NDT} value, the shift, and the margin, of the limiting RPV material) and not by RT_{NDT} shifts, only. Further, the staff determined that the applicant must demonstrate that the driving force based on the plant-specific design-basis accident (DBA) and SSES RPV geometry is also bounded by the generic analysis.

In RAI 4.2.7-1 dated 9/5/2007, the staff requested that the applicant confirm that the current licensing basis relies on the NEDO-10029 methodology and conclusions in addressing the reflood thermal shock issue, and demonstrate that the driving force based on the plant-specific DBA and SSES RPV geometry is also bounded by the generic analysis.

In its response to RAI 4.2.7-1, dated October 18, 2007, the applicant stated that the CLB for Units 1 and 2 credits the analysis documented in NEDO-10029 to address the concern for brittle fracture of the RPV due to reflood, following a postulated LOCA. For the period of extended operation, however, instead of relying on NEDO-10029, the applicant has revised its position by relying on more recent analysis results from the paper, "Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident," published in the Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, in August 1979. This paper was among the submittals in support of the staff's evaluation of the applicant's structural integrity analysis of the Unit 1 RPV, after an out-of-limit cooldown event occurred on January 12, 1989 (NRC Enforcement Action EA 89-042). The staff reconfirmed the acceptability of the 1989 analysis, since it appropriately: (a) selected the controlling DBA LOCA - the steam line break, (b) used finite element analyses in both the thermal and stress analyses, (c) calculated applied stress intensity factors using an influence coefficient approach based on published finite element solutions, and (d) performed a fracture toughness evaluation based on ASME Code, Section XI.

Based on the 1989 analysis results, the applicant further responded that the peak stress intensity factor at 1/4-T of the RPV wall is about 100 ksi√in, which occurs at approximately 300 seconds after initiation of the bounding LOCA event (MSL break). At that instant, the crack tip material temperature is 400 °F. On the fracture toughness side, the maximum adjusted reference temperature at the end of the period of extended operation for the Units 1 and 2 RPV beltline materials is 72.4 °F (see SER Section 4.2.3.2). This yields a fracture toughness of 200 ksi√in for a crack tip material temperature of 400 °F, in accordance with ASME Code Section XI, Appendix G, Figure G-2210-1. Since the driving force (applied stress intensity factor) is much less than the material resistance to fracture (fracture toughness), the staff concludes that brittle fracture of the SSES RPVs due to vessel reflood, following a design basis LOCA during the period of extended operation, is not a concern.

Based on its review, the staff finds the applicant's response to RAI 4.2.7-1 acceptable because the applicant ceased to rely on the NEDO-10029 methodology that caused the staff to issue RAI 4.2.7-1 in addressing the reflood thermal shock issue, and has demonstrated that the driving force based on the plant-specific DBA and SSES RPV geometry is less than the fracture toughness of the SSES RPV materials with a comfortable margin. Therefore, the staff's concern described in RAI 4.2.7-1 is resolved.

The staff determines that the applicant's TLAA for reflood thermal shock of the RPVs meets the regulatory requirements of 10 CFR 54.21(c)(1)(ii) because it was projected to the end of the period of extended operation.

<u>RPV Core Shroud</u>. In LRA 4.3.7, the applicant failed to note that other approved LRA applications for plants such as Monticello, Brunswick, and Browns Ferry treated the reflood thermal shock analysis of the RPV core shroud as a TLAA.

In RAI 4.2.7-2, dated September 5, 2007, the staff requested that the applicant clarify whether the reflood thermal shock analysis of the RPV core shroud for SSES should be a TLAA and; if not, provide a justification.

In its response to RAI 4.2.7-2 dated October 18, 2007, that applicant stated that the reflood thermal shock analysis of RPV core shroud was never performed for either unit and is not part of the CLB for Units 1 and 2.

Based on its review, the staff finds the applicant's response to RAI 4.2.7-2 acceptable because the applicant has verified that the reflood thermal shock analysis of RPV core shroud was never performed for either SSES unit and is, therefore, not part of the CLB for Units 1 and 2. The staff confirms that, pursuant to 10 CFR 54.3(a)(6), an applicant's calculations and analyses are considered as TLAAs only if they are contained or incorporated by reference in the CLB. Therefore, the staff's concern described in RAI 4.2.7-2 is resolved.

4.2.7.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of reflood thermal shock in LRA Section A.1.3.1. As discussed in SER Section 4.2.7.2, the applicant revised its evaluation significantly. The revised UFSAR Supplement Section A.1.3.1 was submitted as a supplement dated December 17, 2007, as part of the applicant's RAI response. On the basis of its review of the revised UFSAR supplement, the staff finds that the summary description of the applicant's actions to address reflood thermal shock is adequate.

4.2.7.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for reflood thermal shock, the revised analyses have been projected to the end of the period of extended operation. The staff also concludes that the revised UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

4.3 Metal Fatigue

A metal component subjected to cyclic loading at loads less than the design load may fail due to fatigue. Metal fatigue of components may have been evaluated based on an assumed number of transients or cycles for the current operating term. The validity of such metal fatigue analysis is reviewed for the period of extended operation. The applicant discussed the fatigue design of SSES components in LRA Section 4.3. The staff reviewed the technical information in LRA Section 4.3 according to the guidance provided in SRP-LR Section 4.3.

The staff review identified several areas where additional information was required to complete the review of the applicant's metal fatigue TLAAs in LRA Section 4.3. Therefore, the staff issued RAIs to the applicant. The following discussion describes the staff's RAIs and the corresponding applicant responses.

4.3.1 Reactor Pressure Vessel Fatigue Analyses

4.3.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1 describes the SSES evaluation of TLAAs for RPV assembly within the scope of license renewal. The applicant discussed the design basis for the RPV assembly and indicated that some 60-year projections of the transients (for the assembly) may exceed the number of cycles used for the design. Table 4.3-1 of the LRA contains the list of reactor design transients and 60-year cycle projections. In addition, Table 4.3-2 of the LRA contains the list of fatigue usage for limiting RCPB locations. These locations include the limiting RPV assembly locations. The applicant stated that metal fatigue of the RPV assembly components is managed by the SSES Fatigue Monitoring Program.

4.3.1.2 Staff Evaluation

In LRA Section 4.3.1, the applicant indicated that the SSES RPV was designed in accordance with the Class 1 requirements of ASME Code Section III. The specific design criterion for fatigue analysis of the ASME Code Class 1 components involves calculating the cumulative usage factor (CUF). The fatigue damage in the component caused by each thermal or pressure transient depends on the magnitude of the stresses caused by the transient. The CUF sums the fatigue damage resulting from each transient. ASME Code Section III requires that the CUF be less than 1.0. The staff reviewed the reactor design transients used in the fatigue analysis of the

RPV assembly components.

In RAI 4.3-1, dated June 12, 2008 the staff identified the following concerns regarding the transients listed in LRA Table 4.3-1:

(a) LRA Table 4.3-1 provides the number of design cycles as well as 60-year cycle projections. It was not clear from the table how the 60-year cycle projections were calculated. Therefore, the staff requested that the applicant provide the cycles accrued to date and explain how the 60-year projections values were calculated.

(b) The design transients for the RPV assembly are listed in UFSAR Table 3.9-1. The staff reviewed UFSAR Table 3.9-1, and found a discrepancy between the UFSAR table and LRA Table 4.3.1. Therefore, the staff requested that the applicant explain the difference in the number design cycles for loss of feedwater heaters and pre-op blowdown between the UFSAR and LRA tables.

(c) The applicant grouped certain transients together, and it was not clear to the staff the basis for grouping these transients together and having a single cycle projection for 60-years. Therefore, the staff requested that the applicant explain why the turbine generator trip transient and other scram transients were grouped and projected together for 60-years. The staff also requested that the applicant explain how scram transient conditions bound all scrams that may be experienced by the plant.

(d) Further, the staff requested that the applicant provide the basis for grouping loss of feedwater heaters and partial feedwater heater bypass as a single transient and include the effect on feedwater nozzle CUF analysis.

In its response to RAI 4.3-1a, dated August 1, 2008, the applicant provided the current cycle counts for Units 1 and 2. The applicant stated that the average number of cycles per year for the past ten-year period was used to estimate the number of additional cycles expected to occur by the end of the period of extended operation. The staff finds the applicant's projections provide a reasonable estimate of the number of transient cycles expected to occur by the end of the period of extended operation. The staff notes that the SSES Fatigue Monitoring Program will monitor the number of actual transients to assure that the number of design transients is not exceeded during the period of extended operation.

In its response to RAI 4.3-1b, dated August 1, 2008, the applicant stated that FSAR Table 3.9-1 lists the total number of cycles for the loss of feedwater heater events as 80. The applicant also stated that 10 of the loss of feedwater heater transients considered in the RPV fatigue analysis involved a turbine trip with 100 percent steam bypass. The applicant further stated that the SSES bypass system is only capable of 25 percent steam bypass; therefore, these 10 transients were not included in LRA Table 4.3-1. The staff finds the applicant's explanation acceptable since the SSES Fatigue Monitoring Program will monitor the loss of feedwater events with 25 percent bypass flow for comparison with the design value of 70 cycles.

The applicant stated that UFSAR Table 3.9-1 lists 10 pre-op blowdown events. Further, the applicant stated that the SSES RPVs did not experience any of these events in the pre-operational phase, and that the event is not applicable following the initial startup. Therefore, the event was not included in LRA Table 4.3-1. The staff finds the applicant's explanation acceptable since there will be no pre-op blowdown events for the SSES Fatigue Monitoring Program to monitor during the period of extended operation.

In its response to RAI 4.3-1c, dated August 1, 2008, the applicant stated that UFSAR Table 4.3-1 separates reactor scrams into two categories; namely, 40 cycles of turbine trips and 140 cycles of other scrams. However, LRA Table 4.3-1 lists 180 cycles of reactor scram events. The applicant also stated that the SSES Fatigue Monitoring Program evaluates all reactor scrams using the most limiting transient. The staff finds the applicant's explanation acceptable since the SSES Fatigue Monitoring Program will track the reactor scrams in a conservative manner by assuming the most conservative transient for each scram event.

Based on its review, the staff finds the applicant's response to RAI 4.3-1(a-d), dated August 1, 2008, acceptable because the applicant has (a) provided the cycles accrued to date and explain how the 60-year projections values were calculated; (b) adequately explained the difference in the number design cycles for loss of feedwater heaters and pre-op blowdown between the UFSAR and LRA tables; (c) satisfactorily explained how scram transient conditions bound all scrams that may be experienced by the plant; and (d) provided a reasonable basis for grouping loss of feedwater heaters and partial feedwater heater bypass as a single transient and include the effect on feedwater nozzle CUF analysis. Therefore, the staff's concern described in RAI 4.3-1 is resolved.

In RAI 4.3-2, dated June 12, 2008, the staff requested that the applicant provide a complete list of design transients used to calculate the 60-year CUF projections for the limiting RCPB locations, and describe, in detail, how they are monitored.

In its response to RAI 4.3-2, dated August 1, 2008, the applicant stated that it had provided a complete list of transients in its response to RAI B.3.1-1. The applicant also sated that its Fatigue Monitoring Program automatically monitors a number of the design transients using plant-specific data. The applicant went on to state that a number of design transients cannot be automatically counted by the Fatigue Monitoring Program and must be manually counted, based on the review of the plant data and operating logs, and then entered into the Fatigue Monitoring Program.

Based on its review, the staff finds the applicant's response to RAI 4.3-2 acceptable because the applicant has provided a complete list of design transients used to calculate the 60-year CUF projections for the limiting RCPB locations, and adequately described how they are monitored. The staff determines that the applicant's method of tracking the design transients reasonable and acceptable.

The applicant noted that some transients may exceed the number used for the design of the RPV components and stated that the limiting components of the RPV will be monitored by the SSES Fatigue Monitoring Program. The applicant committed (Commitment No. 43) to the following actions to address locations where the CUFs approach the allowable limit during the period of extended operation:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable

- Repair of the affected components

- Replacement of the affected components

- Management by an inspection program that has been reviewed and approved by the staff (e.g., periodic non-destructive examination (NDE) of the affected locations at intervals determined by a method acceptable to the staff

As indicated by the applicant, the use of an inspection program to manage fatigue will require prior staff review and approval. The SSES Fatigue Monitoring Program will require that the applicant monitor the fatigue usage of the limiting RPV components and to take corrective actions if the CUF of these components is projected to exceed the allowable value of 1.0, during the period of extended operation. The staff finds that the applicant's Fatigue Monitoring Program provides an acceptable program to manage the fatigue usage of the RPV components during the period of extended operation.

4.3.1.3 UFSAR Supplement

The applicant provided the UFSAR supplement summary description of its TLAA evaluation of the SSES RPV assembly in LRA Section A.1.3.2.1. On the basis of its review of the UFSAR supplement, the staff finds that the applicant has provided an adequate summary description of its actions to address the fatigue evaluation of the RPV assembly.

4.3.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging due to fatigue on the intended function(s) of the RPV assembly will be adequately managed during 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) and; therefore, is acceptable.

4.3.2 Reactor Vessel Internals Fatigue Analyses

4.3.2.1 Summary of Technical Information in the Application

LRA Section 4.3.2 describes the SSES evaluation of TLAAs for RPV internals within the scope of license renewal. The RPV internals are described in terms of two assemblies: core support structures and reactor internals. These two assemblies were designed in accordance within ASME Section III, Subsection NG, and demonstrated to be within allowable limits for 40 years. The applicant performed additional structural evaluations to address operation under extended power uprate conditions and determined that the CUF for all RPV internals remain within the allowable limits for 60 years. Table 4.3-1 of the LRA of the LRA contains the list of reactor design transients and 60-year cycle projections. In addition, the applicant manages reactor vessel internals by the SSES BWR Vessel Internals Program. The SESS BWR Vessel Internals Program manages the RPV internals through inspections.

4.3.2.2 Staff Evaluation

In LRA Section 4.3.2 the applicant stated that its evaluation demonstrating that the fatigue usage factors for all RPV internals remain within the ASME Code Section III, Subsection NG limits, for the extended period of operation, included the effects of operation under extended power uprate conditions.

In RAI 4.3-8, dated October 22, 2008, the staff requested that the applicant explain how the number of reactor design transient cycles for 60 years of plant operation was determined for the analysis of the RPV internals.

In its response to RAI 4.3-8, dated December 12, 2008, the applicant stated that the number of reactor transient design cycles for 40 years of plant operation was multiplied by 1.5 to obtain the number of cycles for 60 years of plant operation.

Based on its review, the staff finds the applicant's response to RAI 4.3-8 acceptable because the applicant has provided a sufficient explanation for how it determined the number of reactor design transient cycles for 60 years of plant operation for the analysis of the RPV internals. The staff notes that number of projected reactor transient cycles used in the evaluation of the RPV internals is greater than the 60-year cycle projections provided in LRA Table 4.3-1. Therefore, the staff's concern described in RAI 4.3-8 is resolved.

The staff finds the applicant's evaluation, which includes the effects of the extended power uprate, acceptable and notes that the applicant also monitors the design transients using its Fatigue Monitoring Program. The staff concludes that the Fatigue Monitoring Program provides additional assurance that the fatigue usage of the RPV internals will remain within acceptable limits, for the period of extended operation.

In addition, the staff also reviewed the LRA Section B.2.9, "BWR Vessel Internals Program" using the guidance provided GALL Aging Management Program (AMP) XI.M9. During the review, the staff noted that the BWR Vessel Internals Program only inspects the guides for the first 12 years of the period of extended operation. The staff noted that the top guide is subject to irradiation-assisted stress-corrosion cracking (IASCC), and that neutron fluence increases with plant operation.
In RAI 4.3-4, dated June 12, 2008, the staff requested that the applicant clarify how the aging effect of IASCC will be managed for the remainder for the period of extended operation.

In its response to RAI 4.3-4, dated August 1, 2008, the applicant stated that its response has been incorporated into SSES BWR Vessel Internals Program. The staff is satisfied with this response to RAI 4.3-4. The staff evaluation of the SSES BWR Vessel Internals Program is provided in SER Section 3.0.3.2.4.

4.3.2.3 UFSAR Supplement

The applicant provided the UFSAR supplement summary description of its TLAA evaluation of RPV internals in LRA Section A.1.3.2.2. On the basis of its review of the UFSAR supplement, the staff finds the applicant has provided an adequate summary description of its actions to address the fatigue evaluation of the RPV internals.

4.3.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the fatigue TLAA for the RPV internals have been projected to the end of the period of extended operation. In addition, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended function of the reactor vessel internals 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) and; therefore, is acceptable.

4.3.3 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3 describes the applicant's evaluation of the effects of the reactor coolant environment on the fatigue life of components. The applicant evaluated locations identified in NUREG/CR-6260 that are applicable to SSES. These components included: reactor vessel shell and lower head, reactor vessel feedwater nozzle, reactor recirculation piping (including inlet and outlet nozzles), core spray line reactor vessel nozzle and associated Class 1 piping, residual heat removal return line Class 1 piping, and feedwater line Class 1 piping. Of the 11 locations on these components, 7 have environmentally adjusted CUFs greater than 1.0. The applicant indicated that these locations would be addressed by the SSES Fatigue Monitoring Program.

4.3.3.2 Staff Evaluation

The Fatigue Monitoring Program at SSES tracks transients and cycles of reactor coolant system components that have explicit design transient cycles, to assure that these components remain within their design basis. Generic Safety Issue (GSI)-166, "Adequacy of the Fatigue Life of Metal Components," raised concerns as to whether the fatigue curves used in the design of the reactor coolant system components were too conservative. Although GSI-166 was resolved for the current 40-year design life of operating components, the staff identified GSI-190, "Fatigue Evaluation of Metal Components for 60-year Plant Life," to address license renewal. The staff closed GSI-190 in December, 1999, concluding:

> The results of the probabilistic analyses, along with the sensitivity studies performed, the iterations with industry (NEI and EPRI), and the different approaches available to the licensees to mange the effects of aging, lead to the conclusion that no generic regulatory action is required, and that GSI-190 is closed. This conclusion is based primarily on the negligible calculated increases in core damage frequency in going from 40 to 60 year lives. However, the calculations supporting resolution of this issue, which included consideration of environmental effects, and the nature of age-related degradation indicate the potential for an increase in the frequency of pipe leaks as plants continue to operate. Thus, the staff concludes that, consistent with existing requirements in 10 CFR 54.21, licensees should address the effects of coolant environment on component fatigue life as aging management programs are formulated in support of license renewal.

The staff reviewed the applicant's environmental fatigue CUFs in LRA Table 4.3-3. The staff noted that the applicant's RPV (Shell at Shroud Support) CUF, including the environmental effects, is projected to exceed 1.0 for 60-year operation. Based on its review of the BWR evaluations in NUREG/CR-6260 and other LRA applications, the staff notes that the RPV shell typically has a CUF (including environmental effects) of less than the allowable value.

In RAI 4.3-3, dated June 12, 2008, the staff requested that the applicant list the transients and corresponding usage factors, and provide the environmental factors used in its evaluation.

In its response to RAI 4.3-3, dated August 1, 2008, the applicant stated that the transients used for the evaluation were listed in its response to RAI B3.1-1. The staff confirms that the applicant's response to RAI B3.1-1 listed all transients monitored by the SSES Fatigue Monitoring Program. The applicant also stated that the environmental usage factor considered the percentage of operating life with hydrogen water chemistry (HWC), noting that the application of HWC significantly reduces the impact of the environment on carbon and low alloy steel components.

In RAI 4.3-10, dated October 22, 2008, the staff requested that the applicant provide a list of transients at the RPV shell shroud support for both units, that are the most significant contributors to the CUFs listed in LRA Table 4.3-2. The staff also requested that the applicant provide a discussion of any conservative assumptions that may have been used in the analyses.

In its response to RAI 4.3-10, dated December 12, 2008, the applicant stated that the shroud support was analyzed for four design transients; natural circulation startup, pre-op blowdown, shutdown, and loss of alternating current power.

The applicant stated that the analysis of these four transients yielded the most severe thermal stresses for the shroud support. The applicant assumed that all transient cycles occurred at the maximum thermal stress, when determining the number of allowable cycles from the fatigue design curves.

This procedure produces a very conservative estimate of the CUF, which explains the relatively high environmental CUF reported for the RPV shell at the shroud support location. The staff notes that the CUF can be significantly reduced by a detailed analysis which considers the actual thermal stress associated with each individual load pair, as discussed in NUREG/CR-6260 Section 4.3.

Based on its review, the staff finds the applicant's response to RAI 4.3-10 acceptable because the applicant has provided a list of transients at the RPV shell shroud support that are the most significant contributors to the CUFs and has adequately explained the assumptions used in its CUF analysis. Therefore, the staff's concern described in RAI 4.3-10 is resolved.

The staff also noted that the environmental usage factors at several other locations in LRA Table 4.3-3 were significantly different from those listed in NURE/CR-6260. The staff determined that SSES is a BWR 4, which is comparable to the older BWR evaluated in NUREG/CR-6260.

In RAI 4.3-9, dated October 22, 2008, the staff requested that the applicant provide a summary of the environmental fatigue life correction factor (Fen) calculation for each component analyzed, including values of oxygen level, temperature and strain rate used in the Fen calculations. The staff also requested that the applicant provide the basis for the oxygen level, temperature and strain rate values used in the Fen calculations.

In its response to RAI 4.3-9, dated December 12, 2008, the applicant stated that the Fen multipliers were calculated assuming HWC conditions for 68 percent of the plant operating life at 60 years. The evaluation of the BWR in NUREG/CR-6260 assumed normal water chemistry (NWC) for the entire plant life. The staff noted that the applicant's response indicated that the dissolved oxygen (DO) level in the feedwater line was low for both NWC and HWC conditions at both units and that the applicant used a Fen of 1.74 for the carbon steel components and a Fen of 2.45 for the low-alloy steel components of the feedwater nozzle. These values are consistent with those calculated by the equations in NUREG/CR-6583 for low DO conditions. The staff finds that the applicant used the correct Fen values for the feedwater nozzle, based on the DO levels reported. The staff notes that the applicant used the more conservative Fen value of 2.45 for the carbon steel component in the feedwater line, which the staff finds acceptable.

The applicant's response also indicated that bounding fluid temperature and strain rates were used to develop the remaining Fen multipliers. The NWC DO level for the core spray and recirculation low alloy nozzles was relatively high. This accounted for the relatively high Fen multiplier of approximately 13 for both units, even though DO level was low for the HWC conditions which exist for the majority of the plant life. The staff finds the Fen values used in the evaluation of the core spray and recirculation nozzles reasonable for the DO levels reported by the applicant.

The applicant also used a Fen of approximately 13 for the evaluation of the stainless steel components of the recirculation loop piping for both units. The applicant assumed bounding values for the fluid temperature and strain rate in the calculation of the Fen values, using the NUREG/CR-5704 equation for stainless steel components. The staff finds the Fen value used for these stainless steel components acceptable, based on the DO levels in the recirculation reported for NWC and HWC.

The applicant used a Fen of 1.49 for the evaluation of the Inconel (nickel-chromium-iron alloy) core spray nozzle safe ends. The evaluation demonstrated acceptable fatigue usage for the safe ends at both units. The license renewal guidance provided in NUREG/CR-5704 addresses austenitic stainless steels and does not contain a specific equation that addresses Inconel material. The Fen value used by the applicant was based on the equation reported in NUREG/CR-6335, "Fatigue Strain-Life Behavior of Carbon and Low-Alloy Steels, Austenitic Stainless Steels, and Alloy 600 in LWR Environments," August 1995. This Fen value is less conservative than the calculated value using the latest equation provided in NUREG/CR-6909, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials," February 2007. The staff notes that NUREG/CR-6909 is not listed in the staff license renewal guidance documents. However, NUREG/CR-6909 does allow for the use of an average temperature in conjunction with an integrated rate approach to determine Fen, which is not as conservative as the procedure used by the applicant. Implementation of the NUREG/CR-6909 procedure would probably result in a larger Fen than was used by the applicant for the core spray nozzle safe ends. However, the core spray nozzle is the limiting component at both units. The staff concludes that use of the NUREG/CR-6909 procedure would not result environmental fatigue usages that are larger in the core spray safe ends than the environmental fatigue usages listed by the applicant for the core spray nozzles. Therefore, the staff finds that the core spray nozzles are the bounding components for the evaluation. The staff further finds that demonstration of an acceptable environmental fatigue usage of the core spray nozzles will provide adequate assurance of acceptable fatigue usage of the core spray nozzle safe ends.

The applicant committed (Commitment No. 43) to the following actions to address the LRA Table 4.3-3 locations where the CUFs, including environmental effects, approach the allowable limit, during the period of extended operation:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable

- Repair of the affected components

- Replacement of the affected components

- Management by an inspection program that has been reviewed and approved by the staff (e.g., periodic NDE of the affected locations at intervals determined by a method acceptable to the staff)

Based on its review, the staff finds the applicant's response to RAI 4.3-9 acceptable because that applicant has provided an adequate summary of the Fen calculation for each component analyzed, including values of oxygen level, temperature and strain rate used in the Fen calculations and has sufficiently explained the basis for the oxygen level, temperature and strain rate values used in the Fen calculations. Therefore, the staff's concerns described in RAI 4.3-9 are resolved.

As indicated by the applicant, the use of an inspection program to manage fatigue will require prior staff review and approval. The SSES Fatigue Monitoring Program will require that the applicant monitor the fatigue usage of the LRA Table 4.3-3 locations and take corrective actions if the CUF, including environmental effects at these locations, is projected to exceed the allowable value of 1.0, during the period of extended operation. The staff finds that the applicant's Fatigue Monitoring Program provides an acceptable program to manage the effects of the reactor coolant environment on the fatigue life of the RCPB components, during the period of extended operation.

4.3.3.3 UFSAR Supplement

The applicant provided the UFSAR supplement summary description of its evaluation of effects of reactor coolant environment on fatigue life of components in LRA Section A.1.3.2.3. On the basis of its review of the UFSAR supplement, the staff finds that the applicant has provided an adequate summary of its environmental fatigue evaluation of RCPB components.

4.3.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of reactor coolant environment on fatigue life of RCPB components will be adequately managed during 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) and; therefore, is acceptable.

4.3.4 Reactor Coolant Pressure Boundary Piping and Component Fatigue Analyses

4.3.4.1 Summary of Technical Information in the Application

LRA Section 4.3.4 describes the SSES evaluation of reactor coolant pressure boundary piping and component fatigue analyses. The piping and components are all within Class 1 boundary. This includes all RCPB piping and in-line components subject to ASME Code Section XI, Subsection IWB, inspection requirements. The components are listed in this section of the LRA and are identified in the UFSAR as well. The SSES Fatigue Monitoring Program monitors the design transients (considered in RCPB components fatigue analyses) and ensures that the fatigue values of selected RCPB components are within limits. In addition, the LRA stated that fatigue on the Class 1 valves would be managed indirectly by monitoring fatigue on the piping.

4.3.4.2 Staff Evaluation

In LRA Section 4.3.4, the applicant stated that the RCPB components are generally designed in compliance with ASME Code Section III, Subsection NB-3600. Subsection NB-3600 contains rules for the design of Class 1 piping systems, which require that the CUF be less than 1.0. The applicant provided the 60-year CUF projections for the limiting RCPB locations in LRA Table 4.3-2. This LRA table shows that the projected CUFs at all Unit 1 and Unit 2 locations are less than 1.0. The staff finds these projected 60-year CUFs acceptable since they are within the ASME Code Section III acceptance limit of 1.0.

In addition to the ASME Code Section III, Subsection NB-3600 criteria, the applicant's high energy pipe break licensing basis criteria requires that the CUF be less than 0.1 in locations between the containment isolation valves (typically designated as the no-break zone). LRA Table 4.3-2 documents the projected 60-year CUF for the Unit 2 feedwater piping in the no-break zone at greater than 0.1. The applicant has committed to monitor the limiting locations in LRA Table 4.3-2, using the SSES Fatigue Monitoring Program. Further discussion of the pipe break criteria is provided in SER Section 4.7.2. The applicant committed to the following actions to address locations where the CUFs approach the allowable limit during the period of extended operation:

- Further refinement of the fatigue analyses to lower the CUFs to less than the allowable
- Repair of the affected components
- Replacement of the affected components
- Management by an inspection program that has been reviewed and approved by the staff (e.g., periodic NDE of the affected locations at intervals determined by a method acceptable to the staff)

As indicated by the applicant, the use of an inspection program to manage fatigue will require prior staff review and approval. The SSES Fatigue Monitoring Program will require that the applicant monitor the fatigue usage of the limiting RCPB components and take corrective actions, if the CUF of these components is projected to exceed the allowable value of 1.0 (or 0.1 in the no-break zone), during the period of extended operation. The staff finds the SSES Fatigue Monitoring Program provides an acceptable program to manage the fatigue usage of the RCPB components during the period of extended operation.

The staff noted that applicant justified the monitoring of fatigue on piping as a way to monitor associated valves, by asserting that fatigue usage is typically much higher on the associated piping systems.

In RAI 4.3-5, dated July 3, 2008, the staff requested that the applicant provide the technical basis for that statement. The applicant's response indicated that ASME Class 1 valves are typically prepared by the valve manufacturer and are not analyzed as part of the piping system. The applicant reviewed a representative sample of ASME Class 1 valve design reports and found the fatigue usage factors of the valves were less than 0.1. These values were less than the fatigue usage factors at the limiting piping locations presented in LRA Table 4.3-2. The staff finds the applicant's response, dated August 1, 2008, reasonable based on its review of previous LRAs which identified that the limiting RCPB piping fatigue usage factors were in the piping components at locations such as branch connection nozzles and piping material transition regions.

4.3.4.3 UFSAR Supplement

The applicant provided the UFSAR supplement summary description of its fatigue TLAA evaluation of the RCPB piping and components in LRA Section A.1.3.2.4. On the basis of its review of the UFSAR supplement, the staff finds that the applicant has provided an adequate summary description of the RCPB fatigue TLAA evaluation.

4.3.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging due to fatigue on the intended function(s) of RCPB components will be adequately managed during 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) and; therefore, is acceptable.

4.3.5 Non-Class 1 Component Fatigue Analyses

4.3.5.1 Summary of Technical Information in the Application

LRA Section 4.3.4 describes the SSES evaluation of non-Class 1 component fatigue analyses. The components included within this section are: pipe, tubing, fittings, tanks, vessels, heat exchangers, valve bodies and bonnets, pump casings, and miscellaneous process components. The applicant reviewed non-Class 1 components with operating temperatures above the specified threshold values. The applicant evaluated these components to determine the number of projected cycles for 60 years was found to be less than 7000 for piping and in-line components.

4.3.5.2 Staff Evaluation

In LRA Section 4.3.4, the applicant stated that explicit fatigue analyses were not required for the evaluation of non-Class 1 components. Instead, the piping design code contained a limit of 7000 equivalent full range thermal cycles. The applicant also stated that all non-Class 1 components above the specified temperature thresholds are projected to have less 7000 cycles.

In RAI 4.3-6, the staff requested that the applicant verify whether any of the numbers of projected cycles for piping and in-line components were derived for evaluation of "partial cycle" transients, where partial cycles are transient cycles that do not experience the full-temperature design cycles.

In its response to RAI 4.3-6, dated 8/1/08, the applicant stated that the 60-year cycle projections assumed each event occurred at full-temperature design range and no partial cycles were used in the evaluation.

Based on its review, the staff finds the applicant’s response to RAI 4.3-6 acceptable because the applicant has assumed the maximum range for each temperature cycle in its assessment. The staff also finds that the applicant has performed an acceptable evaluation of the non-Class 1 components for the period of extended operation. Therefore, the staff’s concern described in RAI 4.3-6 is resolved.

4.3.5.3 UFSAR Supplement

The applicant provided the UFSAR supplement summary description of its fatigue TLAA evaluation of Non-Class 1 Component Fatigue Analyses in LRA Section A.1.3.3. On the basis of its review of the UFSAR supplement, the staff finds that the applicant has provided an adequate summary description of the fatigue TLAA evaluation non-Class 1 components.

4.3.5.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses of Non-Class 1 components will remain valid during 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) and; therefore, is acceptable.

4.4 Environmental Qualification of Electrical Equipment

The 10 CFR 50.49 EQ program is a TLAA for purposes of license renewal. The TLAA of the EQ of electrical components includes all long-lived, passive, and active electrical and I&C components that are important to safety and are located in a harsh environment. The harsh environments of the plant are those areas subject to environmental effects by LOCAs or HELBs. 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. The applicant shall demonstrate that for each type of EQ equipment, one of the following is true: (1) the analyses remain valid for the period of extended operation, (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

4.4.1 Summary of Technical Information in the Application

LRA Section 4.4 summarizes the evaluation of EQ of electrical equipment for the period of extended operation. The applicant states that SSES EQ program is in compliance with the requirement of 10 CFR 50.49, and is being used to manage the aging of equipment in the EQ program during the current license term. The existing SSES EQ program will be used to manage aging of equipment in the EQ program during the period of extended operation and includes provision to ensure that the qualification bases are maintained and the components do not exceed their qualified lives.

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 plant basis documents to determine whether the applicant provided adequate information to meet the requirement of 10 CFR 54.21(c)(1). For the electrical equipments identified in the EQ master list, the applicant uses 10 CFR 54.21(c)(1)(iii) in its 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 applicant’s EQ program to determine whether it will assure that the electrical and I&C components covered under this program will continue to perform their intended functions, consistent with the CLB, for the period of extended operation.

The staff’s evaluation of the components qualification focused on how the EQ program manages the aging effects to meet the requirements pursuant to in 10 CFR 50.49.

The staff conducted an audit of the information provided in LRA Section B 3.2 and program basis documents. On the basis of its audit, the staff finds that the EQ program, which the applicant claimed to be consistent with GALL AMP X.E1, “Environment Qualification of Electrical Components,” is consistent with the EQ program in the GALL Report. Therefore, the staff finds that the EQ program is capable of programmatically managing the qualified life of components within the scope of the program for license renewal. The continued implementation of the EQ program provides assurance that the aging effects will be managed and that components within the scope of the EQ program will continue to perform their intended functions for the period of extended operation.

4.4.3 UFSAR Supplement

In LRA Section A.1.3.4, the applicant provided an updated final safety analysis report (UFSAR) supplement of summary description of EQ of electrical equipment. This summary description is not consistent with that in SRP-LR Table 4.4.2 as it does not contain reanalysis attributes. Reanalysis must address attributes of the applicant’s analytical methods; data collection and reduction methods; underlying assumptions; acceptance criteria; corrective actions, if acceptance criteria are not met; and the period of time, prior to the end of qualified life, when the reanalysis will be completed.

In RAI B.3.2-1, the staff requested that the applicant revise the UFSAR supplement description to include these reanalysis attributes.

In response to RAI B.3.2-1, dated August 5, 2008, the applicant stated that LRA Section A.1.3.4 is revised to include the reanalysis attributes as follows:

> A.1.3.4 Environmental Qualification of Electric Equipment
> Environmental Qualification analyses for those components with a qualified life of 40 years or greater are identified as TLAA for SSES. NRC regulation 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants" requires licensees to identify electrical equipment covered under this regulation and to maintain a qualification file demonstrating that the equipment is qualified for its application and will perform its safety function up to the end of its qualified life.
>
> *10 CFR 50.49 requires EQ components that are not qualified for the current license term to be refurbished, replaced, or have their qualifications extended prior to reaching the aging limits established in the aging evaluation. Reanalysis of aging evaluations to extend the qualifications of components is performed on a routine basis as part of the EQ Program. Important attributes for the reanalysis of aging evaluations include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, corrective actions (if acceptance criteria are not met), and the time remaining to the end of qualified life.*
>
> The SSES EQ Program is an existing program that implements the requirements of 10 CFR 50.49 and will be used to manage the effects of aging on the intended function(s) of the components associated with EQ TLAA for the period of extended operation.

Based on its review, the staff finds the applicant’s response to RAI B.3.2-1 acceptable because the applicant has revised the UFSAR supplement description to include the reanalysis attributes. Therefore, the staff's concern described in RAI B.3.2-1 is resolved.

With the amendment as described above, the applicant provides an adequate summary description of TLAA evaluation. This description is consistent with the guidance found in SRP-LR Table 4.4.2. On the basis of its review of the UFSAR supplement, the staff finds that the summary description of the applicant's actions to address EQ of electrical equipment is adequate, as required by 10 CFR 54.21(d).

4.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for EQ of electrical equipment, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d) and; therefore, is acceptable.

4.5 Concrete Containment Tendon Prestress

4.5.1 Summary of Technical Information in the Application

LRA Section 4.5 summarizes the evaluation of concrete containment tendon prestress for the period of extended operation. Units 1 and 2 have Mark II primary containments with no pre-stressed tendons; therefore, tendon prestress evaluations are not applicable.

4.5.2 Staff Evaluation

Units 1 and 2 containment has no prestressed tendons; therefore, the staff finds that this TLAA is not required.

4.5.3 UFSAR Supplement

The staff concludes that no UFSAR supplement is required because Units 1 and 2 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 this TLAA is not required.

4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses

4.6.1 ASME Code Class MC Components

4.6.1.1 Summary of Technical Information in the Application

LRA Section 4.6.1 summarizes the applicant's evaluation of fatigue of ASME Code Class MC components for the period of extended operation. Fatigue evaluations were required for analyses qualifying as TLAAs for the containment penetrations, hatches, and drywell head. The applicant states that it compared the design thermal cycles for those evaluations against the maximum projected thermal cycles for extended life to 60 years and determined that the penetration fatigue evaluations are adequate and require no updating for license renewal.

4.6.1.2 Staff Evaluation

The staff reviewed LRA Section 4.6.1, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of extended operation.

In LRA Section 4.6.1, the applicant stated that the design thermal cycles for ASME Code Class MC components are 500 cycles associated with plant startup and shutdown and one cycle for a DBA. The staff examined UFSAR Section 3.8.2, “ASME Class MC Steel Components of the Containment” and confirmed the design thermal cycles for the fatigue evaluation of the containment ASME Code Class MC stainless steel components.

The staff reviewed LRA Section 4.6.1 and the relevant references cited in the TLAA. The staff noted LRA states that the RPV assembly and internal components were designed for a combined total of 228 events for startup and shutdown for 40 years, and projected for a total of 296 cycles for extended life to 60 years. The staff finds that the 500 design cycles for startups and shutdowns remains well above the projected 60-year value, and the one cycle for DBA is assumed in the design for the life of the plant, whether that is 40 years or 60 years. On this basis, the staff agrees that the existing analysis of fatigue remains valid through the period of extended operation. The staff finds this TLAA acceptable because the projected 60-year thermal cycles are bounded by the design thermal cycles based on UFSAR Section 3.8.2.

*4.6.1.3 **UFSAR** Supplement*

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of fatigue for the containment ASME Code Class MC stainless steel components in LRA Section A.1.3.5.1. On the basis of its review of the UFSAR supplement, the staff finds that the summary description of the applicant’s actions to address fatigue of the containment ASME Code Class MC stainless steel components is adequate because the applicant has provided information equivalent to the guidance found in SRP-LR Table 4.6-1.

4.6.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for the containment ASME Code Class MC components fatigue TLAA, 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) and; therefore, is acceptable.

4.6.2 Downcomer Vents and Safety Relief Valve Discharge Piping

4.6.2.1 Summary of Technical Information in the Application

LRA Section 4.6.2 summarizes the applicant’s evaluation of fatigue for downcomer vents and SRV discharge piping for the period of extended operation. The applicant states that to ensure the integrity of the downcomers and SRV discharge piping for the original 40-year life of the plant, analyses were performed for the appropriate load combinations and their associated number of cycles. Fatigue evaluations were required for analyses qualifying as TLAAs. The applicant also states that it calculated the combined stress and corresponding equivalent stress cycles to obtain the fatigue CUF in accordance with the ASME Section III, Subsection NB-3600.

In the SSES LRA, the applicant summarized the maximum CUF for the downcomers in Table 4.6-1 and for the SRV discharge piping in LRA Table 4.6-2. The applicant compared the number of events assumed in the 40-year design basis analyses against the projected 60-year number and determined that the fatigue evaluations are adequate and require no updating for license renewal.

4.6.2.2 Staff Evaluation

The staff reviewed LRA Section 4.6.2 pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of extended operation.

During the review, the staff reviewed the applicant's related onsite basis documents to confirm the design cycles of downcomer vents and SRV discharge piping for the fatigue evaluation. In LRA Table 4.6-1, the applicant summarized the maximum CUF for the downcomers. However, the staff noted that Operational Cases Four and Six are identical, while the CUF values are different.
In RAI 4.6.2-1, dated June 17, 2008, the staff requested that the applicant clarify the discrepancy.

In its response to RAI 4.6.2-1, dated July 8, 2008, the applicant stated the maximum downcomer CUF described in LRA Table 4.6-1 is incorrect and will be revised based on the Design Assessment Report for Units 1 and 2 and result an amendment to Operational Case Six from "Emergency/Faulted – SBA:SRV+CHUG" to "Emergency/Faulted – SBA: CHUG+SSE".

Based on its review, the staff finds the applicant's response to RAI 4.6.2-1 acceptable because the applicant has amended LRA Table 4.6-1 to clarify the maximum downcomer CUF discrepancy. Therefore, the staff's concern described in RAI 4.6.2-1 is resolved.

The staff reviewed LRA Section 4.6.2, the related onsite basis documents, and the applicant's response to RAI 4.6.2-1. The staff notes that the applicant has summarized the maximum CUFs for downcomers with different operational cases in LRA Table 4.6-1, and the maximum CUFs for SRV discharge piping in the suppression pool area in LRA Table 4.6-2. The staff finds that all CUFs for both 40 years and 60 years are less than 1. The staff also finds that the number of cycles assumed in the applicant's design basis (40-year) for the both downcomer and SRV discharge piping remains above the projected 60-year number of events. On this basis, the staff agrees with the applicant that the existing analysis of fatigue remains valid through the period of extended operation.
The staff finds this TLAA acceptable because the 60-year anticipated number of events is bounded by the number assumed in the design basis analysis.

4.6.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the downcomer vents and SRV discharge piping in LRA Section A.1.3.5.2. On the basis of its review of the UFSAR supplement, the staff finds that the summary description of the applicant's actions to address fatigue for the downcomer vents and SRV discharge piping is adequate because the applicant has provided information equivalent to the guidance found in SRP-LR Table 4.6-1.

4.6.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for the downcomer vents and SRV discharge piping fatigue TLAA, 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) and; therefore, is acceptable.

4.6.3 Safety Relief Valve Quenchers

4.6.3.1 Summary of Technical Information in the Application

LRA Section 4.6.2 summarizes the applicant's evaluation of SRV quenchers fatigue for the period of extended operation. The applicant states that to ensure the integrity of the SRV quenchers for the original 40-year life of the plant, two analyses were performed based on the number of allowable cycles, one using design loading, and the other using test loading data. Seven thousand cycles were assumed as design cycles for the components. Fatigue evaluations were required for analyses qualifying as TLAAs. The applicant calculated CUF for each analysis, and summarized the CUF for the SRV quenchers in LRA Table 4.6-3. The applicant further states that it compared the number of cycles assumed in the 40-year design basis analyses against the projected 60-year number from FatiguePro software and determined that the fatigue evaluations are adequate and require no updating for license renewal.

4.6.3.2 Staff Evaluation

The staff reviewed LRA Section 4.6.3, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of extended operation.

During the audit and review, the staff reviewed the applicant's related onsite basis documents to confirm the design cycles of the SRV quenchers for the fatigue evaluation. The staff noted that all components of the quenchers, except the base support which was designed as a "Code Paragraph NF" component support, were designed and analyzed in accordance with ASME Code Section III, Paragraph NC-3200, 1977 Edition with 1977 Summer Addenda. The staff is not clear which Code Paragraph NF the applicant referred to. In RAI 4.6.3-1, dated June 17, 2008, the staff requested that the applicant clarify which code was being referenced.

In its response to RAI 4.6.3-1, dated July 8, 2008, the applicant stated that LRA Section 4.6.3 is incorrect and "Code Paragraph NF" will be revised to "Code Subsection NF." The staff confirmed that that applicant has amended LRA Section 4.6.3 to reflect this change.

Based on its review, the staff finds the applicant's response to RAI 4.6.3-1 acceptable because the applicant has amended LRA Section 4.6.3 to correct the code reference. The staff confirms that Code Subsection NF is the correct reference. Therefore, the staff's concern described in RAI 4.6.3-1 is resolved

The staff reviewed LRA Section 4.6.3, the related onsite basis documents, and the applicant's response to RAI 4.6.3-1. The staff notes that the projected quencher cycles and CUFs are displayed in LRA Table 4.6.3. The staff finds that the expected number of cycles for each quencher component analyzed is 7000, and that all CUFs for both 40 years and 60 years are less than 1. The staff also finds that the number of design cycles for the SRV quenchers exceeds the number of projected 60-year cycles. On this basis, the staff agrees with the applicant that the existing analysis of fatigue remains valid through the period of extended operation. The staff finds this TLAA acceptable because the number of projected 60-year cycles is bounded by the number assumed in the design basis analysis.

4.6.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the SRV quenchers in LRA Section A.1.3.5.3. On the basis of its review of the UFSAR supplement, the staff finds that the summary description of the applicant's actions to address fatigue for the SRV quenchers is adequate because the applicant has provided information equivalent to the guidance found in SRP-LR Table 4.6-1.

4.6.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for the SRV quenchers fatigue TLAA, 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) and; therefore, is acceptable.

4.7 Other Plant-Specific Time-Limited Aging Analyses

4.7.1 Main Steam Line Flow Restrictor Erosion Analyses

4.7.1.1 Summary of Technical Information in the Application

LRA Section 4.7.1 summarizes the evaluation of Main Steam Line (MSL) flow restrictor erosion analyses for the period of extended operation. A flow restrictor is incorporated in each MSL to limit flow to 200 percent of rated flow if a MSL ruptures outside containment. Flow restrictor erosion is a safety concern because it could impair flow restrictor ability to limit vessel blowdown following a MSL break. As erosion is a time-related phenomenon, analyses of its effect on flow restrictors over the 40-year life of the plant are TLAAs. According to UFSAR Section 5.4.4, flow restrictor cast stainless steel material has excellent resistance to erosion by high-velocity steam. Only very slow erosion occurs and such a slight enlargement of the flow restrictor opening has no safety significance. The UFSAR states that after 40 years of operation the choke flow through the restrictor would increase by no more than 5 percent due to erosion, implying a 5-percent increase in released radiological dose, insignificant for a postulated break in a MSL outside containment.

Another 20 years of operation will result in further erosion of the MSL flow restrictor throats, which can be extrapolated linearly from 40 to 60 years. This extrapolation is conservative because the rate of erosion is expected to decrease as the restrictor throat area increases (operation at extended power uprate conditions does not affect erosion rate significantly). Therefore, erosion for the 20 years of extended operation will be approximately half the erosion for the first 40 years, and the corresponding increase in steam flow will be approximately half of the increase (5 percent) in steam flow due to erosion at the end of 40 years, meaning that by the end of 60 years the increase in flow compared to flow at the beginning of life will be no more than 7.8 percent. Therefore, the released dose for the accident case at 60 years would be increased no more than 7.8 percent. Such an insignificant increase in dose over the analyzed case remains within regulatory limits, as indicated in UFSAR Section 15.6.4.5.3. Hence, MSL flow restrictor performance is not impacted significantly by additional erosion during the period of extended operation, and the potential effect of the degraded performance is acceptable.

4.7.1.2 Staff Evaluation

The staff reviewed LRA Section 4.7.1, 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 design safety function of the flow restrictors is to limit the radiological release outside of the drywell following a MSL break and prior to main steam isolation valve closure.

In LRA Section 4.7.1, the applicant stated that erosion of the MSL flow restrictors during 40 years of operation would increase steam flow rate by no more than 5 percent, and an additional 20 years of operation could be linearly extrapolated for a total increase in steam flow (and therefore dose) of 7.5 percent. The applicant based the 5 percent increase on an erosion rate "as high as 0.004 inches per year" of the main steam flow restrictor. In RAI 4.7.1-1a the staff requested that the applicant explain the basis for assuming an erosion rate of 0.004 inches per year and whether this rate was applicable for the term of extended operation. The staff also requested that the applicant clarify whether this assumption was conservative, realistic, or non-conservative.

In its response to RAI 4.7.1-1a dated October 16, 2007, the applicant provided its basis for an additional 20 years of operation that included justification for the assumed erosion rate of the MSL flow restrictors. In addition, the applicant submitted evidence verifying that there was sufficient margin on the acceptable dose limits, in the event of a radiological release outside of containment.

As justification for the assumed erosion rate over 20 years of extended operation, the applicant cited EPRI Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools (EPRI Tools), Revision 4, Appendix A, Section 3.1.6, on treated water. This EPRI guideline states that material loss due to erosion is possible only if the fluid stream contains particulate (or water droplets in two phase flow) that impinges upon the surface of the metal. The applicant stated that since the environment in the MSLs, at the location of the flow restrictors, is treated water in the form of steam (with only 0.1 to 0.2 percent moisture), virtually no water droplets exist in the steam to cause erosion. This assumption is supported by inspection results indicating no significant erosion damage in the MSLs at Units 1 and 2. The staff reviewed the applicants justification for the assumed erosion rate and finds that material loss due to erosion is possible only if the fluid stream contains particulate (or water droplets in two phase flow) impinges upon the surface of the metal. The staff also confirmed the applicant's inspection results indicating no siginifcant erosion damage in the MSLs at Units 1 and 2. The staff finds the applicants justification acceptable.

The staff reviewed EPRI report TR-106611, "Flow Accelerated Corrosion in Power Plants," Revision 1 and notes that flow-accelerated corrosion (FAC) rates drop to essentially zero when the chromium content of the alloy is above 0.5 percent and the temperature is greater than 450 F. The report also states that type 304 stainless steel (which contains a minimum of 18 percent chromium) has more than 250 times greater resistance to FAC than carbon steel. The MSL flow restrictors in question are constructed of cast austenitic stainless steel (American Society for Testing of Materials A351 Grade CF8), which contains a minimum of 18 percent chromium, and typically operate at a steam temperature of 543 °F. The staff determined that the applicant's FAC program inspection of the carbon steel piping immediately downstream of the flow restrictors on Unit 2, showed the highest wear rate to be 0.019 inches per year, which is only about five times higher than the assumed wear rate of the stainless steel flow restrictors. When compared to the nominal ratio of 250 times given in the EPRI report, the staff finds that there is sufficient margin to assume that the 0.004 inches per year FAC rate is a very conservative value.

In LRA Section 4.7.1, the applicant stated that any erosion that occurs will increase the throat cross-sectional area, thereby decreasing flow velocity and, thus, decrease the actual wear rate. Therefore, the initial assumed wear rate of 0.004 inches per year will remain conservative for the period of extended operation.

In RAI 4.7.1-1b, the staff requested that the applicant provide a copy of its calculation that demonstrated the acceptability of the main steam flow restrictors for the license renewal period. The staff also requested that the applicant provide descriptions of all relevant parameters and, a basis and justification for all assumptions.

In its response to RAI 4.7.1-1b, dated October 16, 2007, the applicant stated that with an erosion rate of 0.004 inches per year, the throat diameter of the MSL flow restrictor's venturi section would increase by 0.480 inches (0.004 x 2 x 60) over the course of 60 years. Because the flow restrictor had an original throat diameter of 12.580 inches, the final diameter would be 13.060 inches (12.580 + 0.480) after 60 years. This would increase the throat area of the flow restrictor by 7.8 percent, and, because the flow is proportional to the throat area, the flow through the restrictor following a MSL break would increase by 7.8 percent. The staff finds the response to RAI 4.7.1-1b acceptable.

To postulated a MSL break the staff performed an evaluation of the Control Room Habitability Envelope and of the offsite radiological doses (at the exclusion area boundary and the low population zone) following a MSL break, outside of containment, using the Alternative Source Term methodology described in RG 1.183. This methodology assumed a mass release that was a 20 percent increase over the original licensing value. This assumption provides additional margin for the extended power uprate, for which the applicant had submitted a separate license amendment. The Alternative Source Term methodology demonstrated that the highest ratio of any calculated dose to its acceptance criteria is 18.6 percent. Therefore, even with the 20 percent flow increase, a safety margin on the doses of at least 81.4 percent still remained. The staff determined that the additional 20 percent margin was unnecessary, because documented results demonstrate that a mass release following a MSL break will not increase (SSES PUSAR submittal, PLA-6076). The staff determines that an increase of 7.8 percent in the mass release from a postulated steam line break is acceptable because it is enveloped by the 20 percent increase considered in the extended power uprate evaluation, which was subsequently determined to be unnecessary.

4.7.1.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of MSL flow restrictor erosion analyses in LRA Section A.1.3.6. On the basis of its review of the UFSAR supplement, the staff finds that the summary description of the applicant's actions to address MSL flow restrictor erosion analyses is adequate.

4.7.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to

10 CFR 54.21(c)(1)(ii), that, for the MSL flow restrictor erosion analyses, 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) and; therefore, is acceptable.

4.7.2 High Energy Line Break Cumulative Fatigue Usage Factors

4.7.2.1 Summary of Technical Information in the Application

LRA Section 4.7.2 discusses the evaluation of TLAAs associated with the postulation HELBs. The SSES design criteria used to determine postulated HELB design locations included the calculated fatigue CUF based on the number of design transients assumed for the original 40-year life of the plant. Postulated pipe breaks were evaluated at locations where the design CUF was greater than 0.1. The applicant indicated that additional locations could exceed the CUF criteria in 60 years. The applicant will use the SSES Fatigue Monitoring Program to monitor the fatigue usage of the piping systems and to determine whether any additional locations exceed the pipe break criteria during the period of extended operation.

4.7.2.2 Staff Evaluation

In LRA Section 4.7.2, the applicant stated that its Fatigue Monitoring Program will be used to monitor the fatigue usage of piping systems during the period of extended operation. The applicant also stated that appropriate corrective actions would be taken to address any new locations where the CUF is projected to exceed 0.1, during the period of extended operation.

In RAI 4.7.2-1, dated September 5, 2007, the staff requested that the applicant clarify whether any Class 1 high-energy piping locations with a CUF value of less than 0.1, by the current design basis, may exceed 0.1 during the period of extended operation.

In its response to RAI 4.7.2-1, dated August 1, 2008, the applicant stated that there are additional locations where the CUF may exceed 0.1 during the period of extended operation. The applicant further stated that its Fatigue Monitoring Program will be enhanced to ensure that high-energy piping systems continue to meet the applicable pipe break criteria, as specified in FSAR Section 3.6, during the period of extended operation. The staff confirms that the applicant has revised Commitment No. 43 to enhance the SSES Fatigue Monitoring Program as part of its response to RAI B.3.1-4. The revised commitment contains a provision to review HELB evaluations.

The staff finds the applicant's revised Commitment No. 43 to enhance the SSES Fatigue Monitoring Program adequately addresses the TLAA associated with high energy pipe breaks. Therefore, the staff's concern described in RAI 4.7.2-1 is resolved.

4.7.2.3 UFSAR Supplement

The applicant provided the UFSAR supplement summary description of its TLAA evaluation of HELB CUFs in LRA Section 1.3.6.2. On the basis of its review of the UFSAR supplement, the staff finds the summary description of the applicant's actions to address the TLAA associated with postulated piping rupture locations due to fatigue usage is adequate.

4.7.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the fatigue analysis of RCPB components, including the fatigue the criteria for postulation of high-energy pipe breaks, will be adequately managed during 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) and; therefore, is acceptable.

4.7.3 Core Plate Rim Hold-Down Bolts

4.7.3.1 Summary of Technical Information in the Application

LRA Section 4.7.3 summarizes the evaluation of core plate rim hold-down bolts for the period of extended operation. The SER that refers to BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines," for license renewal indicates loss of preload on the core plate rim hold-down bolts as one TLAA that must be addressed by applicants seeking license renewal. BWRVIP-25, Appendix B states that the core plate bolts will have at least 81-percent preload remaining at 54 EFPY. The applicant determined that loss of preload due to non-irradiation effects was negligible.

GE extended power uprate analyses evaluated the core plate hold-down bolts and determined that the preload at the end of 60 years would be adequate to prevent lateral motion of the core plate.

4.7.3.2 Staff Evaluation

The staff reviewed LRA Section 4.7.3, 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.

In LRA Section 4.7.3, the applicant stated that based on BWRVIP-25, the core plate bolts will have at least 81 percent preload remaining at 54 EFPY. The applicant further stated that the GE extended power uprate analyses, which evaluated the core plate hold-down bolts, showed that the preload at the end of 60 years would be adequate to prevent lateral motion of the core plate for the period of extended operation. The staff notes that this conclusion is not supported by any SSES plant-specific evaluation.

In RAI 4.7.3-1, dated September 5, 2007, the staff requested that the applicant:

(1) Demonstrate the applicability of the BWRVIP-25 loss of preload analysis to the Susquehanna units. Identify the temperature of the bolts during the normal operation and the projected bolt neutron fluence at the end of the period of extended operation for the Susquehanna units. Provide a plant-specific evaluation demonstrating that the loss of preload due to stress relaxation for the Susquehanna RPV core plate hold-down bolts is bounded by the value of 19 percent from BWRVIP-25 Appendix B.

(2) Perform a plant-specific core plate hold-down bolt analysis using the BWRVIP-25 Appendix A methodology, demonstrating that the axial and bending stresses for the mean and highest loaded hold-down bolts will not exceed the ASME Code Section III allowable stresses for P_m (primary membrane) and $P_m + P_b$ (primary membrane plus bending) as a result of a plant-specific reduction in the bolt preload at the end of the

extended period of operation. State the assumptions on which the plant-specific analysis was based.

(3) Provide sufficient information regarding the GE extended power uprate analyses on the core plate hold-down bolts mentioned in LRA Section 4.7.3 so that the staff can determine whether the Susquehanna hold-down bolts are adequate to prevent lateral motion of the core plate for the period of extended operation.

In its response to RAI 4.7.3-1,dated October 18, 2007, items 1 and 2, dated October 18, 2007, the applicant stated that it proposes to address the loss of preload on the core plate rim hold-down bolts, prior to entering the period of extended operation, by one of the following two actions:

(1) Perform an SSES plant-specific evaluation consistent with BWRVIP-25 to demonstrate that the core plate rim hold-down bolts will be capable of preventing lateral displacement of the core plate for the period of extended operation. The evaluation will determine the maximum expected reduction in the bolt preload at the end of the period of extended operation, considering all applicable parameters (*i.e.*, operating temperature, operating loads, and irradiation effects) and demonstrate the acceptability of the final preload at the end of the period of extended operation. Using the methodology of BWRVIP-25 Appendix A, the evaluation will also determine the primary membrane and bending stresses for the limiting bolt(s) to demonstrate that ASME Code allowables are not exceeded as a result of the reduction in bolt preload at the end of the period of extended operation. The evaluation will be submitted to the staff for review no less than two years prior to the period of extended operation.

(2) Install core plate wedges to structurally replace the lateral load resistance provided by the hold-down bolts. With wedges installed, any loss of preload on the core plate rim hold-down bolts during the period of extended operation will have no effect on the lateral stability of the core plate.

The applicant further stated that if the evaluation described as (1) above is unable to demonstrate acceptable bolt preload or bolt stress values at the end of the period of extended operation, appropriate corrective action will be taken prior to entering the period of extended operation. These proposed measures are summarized in Disposition of LRA Section 4.7.3, UFSAR Supplement Section A.1.3.6.3, and a new commitment in LRA Table A-1.

Based on its review, the staff finds the applicant's response to RAI 4.7.3-1 acceptable because the applicant has committed (Commitment No. 55) to address the loss of preload on the core plate rim hold-down bolts, prior to entering the period of extended operation. The staff reviewed the applicant's commitment and concludes that conducting the proposed plant-specific analysis, consistent with BWRVIP-25 guidance, is an acceptable method of addressing the TLAA for the core plate rim hold-down bolts, as described in the SER for compliance with the license renewal rule, dated December 7, 2000. The staff also concludes that installation of core plate wedges is considered an appropriate corrective action, consistent with BWRVIP-25, as described in the SER for operating plants, dated December 19, 1999. Either action will provide adequate assurance that the 60-year stress relaxation of the core plate hold-down bolts, due to neutron exposure, will not compromise the structural integrity and operability of the core plate to the end of the period of extended operation. The staff determines that since the plant-specific analysis described by the applicant in action (1) will consider applicable irradiation effects not based on the GE extended power uprate report, item (3) of the RAI is no longer a concern. Therefore, the staff's concerns described in RAI 4.7.3-1 are resolved.

4.7.3.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of core plate rim hold-down bolts in LRA Section A.1.3.6. On the basis of its review of the revised UFSAR supplement, the staff finds that the summary description of the applicant's actions to address core plate rim hold-down bolts is adequate.

4.7.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant's Commitment No. 55 to provide a plant-specific TLAA analysis on the stress relaxation of the core plate rim hold-down bolts for the period of extended operation, two years prior to the start of the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii), is acceptable. Further, the non-TLAA alternative of installing core plate wedges as structural replacements for the lateral load resistance, provided by the hold-down bolts, is considered acceptable. 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) and; therefore, is acceptable.

4.7.4 Irradiation Assisted Stress Corrosion Cracking (IASCC)

4.7.4.1 Summary of Technical Information in the Application

LRA Section 4.7.4 summarizes the evaluation of IASCC for RPV internals for the period of extended operation. Among RPV internals, top guide, core shroud, in-core flux monitoring dry tubes, and core plate were identified by the applicant as being susceptible to IASCC for the period of extended operation for both units. The applicant stated that all identified components have been evaluated for IASCC by the BWRVIP in BWRVIP-26-A, "BWR Top Guide Inspection and Flaw Evaluation Guidelines," for the top guide, BWRVIP-76, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines," for the core shroud, BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines," for the in-core flux monitoring dry tubes, and BWRVIP-25 for the core plate. The applicant further stated that (1) the inspection and evaluation guidelines of the identified BWRVIP reports will be implemented under the BWR Vessel Internals Program for SSES, (2) additional requirements and actions have been identified in the responses to the BWRVIP applicant action items in LRA Appendix C, and (3) any future conditions, requirements, or limitations imposed by the staff's SER for BWRVIP-76 (LR) regarding compliance with the license renewal rule will be addressed by PPL. Therefore, the aging effects due to IASCC of RPV internals will be adequately managed for the period of extended operation.

4.7.4.2 Staff Evaluation

The staff reviewed this newly added LRA Section 4.7.4, to verify, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended functions will be adequately managed for the period of extended operation.

LRA Section 4.7.4 was not in the original LRA submittal. During the TLAA review, the staff found that the applicant did not discuss IASCC in LRA Section 4.0, but rather, in LRA Appendix C. This Appendix includes the applicant's responses to BWRVIP report application action items.

The majority of the BWRVIP reports discussed in LRA Appendix C relate to the structural integrity of austenitic stainless steel RPV internals subject to IASCC. Specific reports include BWRVIP-25, BWRVIP-26-A, BWRVIP-76, and BWRVIP-47-A. Their associated action items usually require that the applicant evaluate the RPV internals TLAAs, for the period of extended operation. However, not all applicant responses to these BWRVIP report action items described in LRA Appendix C, adequately address the BWRVIP report issues as TLAAs.

In RAI 4.7.3-2, dated September 5, 2007, the staff requested that the applicant: (1) address IASCC in austenitic stainless steel RPV internals, in the TLAA section, to build the connection between LRA Section 4.0 and LRA Appendix C, and (2) commit to address all BWRVIP-76 (LR) requirements and conditions, as modified by the staff SER on this report, to be issued after the staff review of BWRVIP-76 (LR) is completed.

In its response to RAI 4.7.3-2, item 1, dated October 18, 2007, the applicant revised LRA Section 4.0 by addressing the IASCC of RPV internals in the following new TLAA section: LRA Section 4.7.4, "Irradiation Assisted Stress Corrosion Cracking (IASCC)."
The staff determined that the revision to the LRA Section 4.7.4 provides clear links among the RPV internals susceptible to IASCC (*i.e.*, top guide, core shroud, in-core flux monitoring dry-tubes, and core plate); the applicant's BWR Vessel Internals Program, which manages cracking, loss of material, and reduction of fracture toughness for the RPV internals; and the applicant's committed implementation of the inspection and evaluation guidelines, in accordance with the BWRVIP reports for the various internals. The staff notes that the applicant's BWR Vessel Internals Program includes more stringent inspection requirements for the top guide than those in BWRVIP-26-A.

In its response to RAI 4.7.3-2, item 2, dated October 18, 2007, the applicant stated that in addition to the actions implemented under the BWR Vessel Internals Program, specific requirements imposed for certain components for license renewal were addressed in LRA Appendix C. The staff confirms that the applicant has added commitment No. 55 to the LRA Table A-1 which addresses any future conditions, requirements, or limitations imposed by the staff's SER for BWRVIP-76 (LR).

Based on its review, the staff finds the applicant's response to RAI 4.7.3-2 acceptable because the applicant has revised LRA Section 4.0 to include a new subsection addressing the IASCC of RPV internals. In addition, the applicant has committed to address any future conditions, requirements, or limitations imposed by the staff's SER for BWRVIP-76 (LR). Therefore, the staff's concerns described in RAI 4.7.3-2 are resolved.

The staff finds the applicant's conclusion for this TLAA acceptable because the applicant has: (1) identified the RPV internals susceptible to IASCC; (2) employed AMP B.2.9, the BWR Vessels Internal Program, to manage IASCC, based on relevant BWRVIP inspection and evaluation guidelines; and (3) committed to address any future conditions, requirements, or limitations imposed by the staff's SER for BWRVIP-76 (LR). The staff concludes that the applicant's TLAA is considered adequate to manage the degradation of RPV internals due to this aging effect.

4.7.4.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of RPV internals susceptible to IASCC in the newly added LRA Section A.1.3.6.4. On the basis of its review of the UFSAR supplement, the staff finds that the summary description of the applicant's actions to address this TLAA is adequate.

4.7.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for RPV internals susceptible to IASCC, the aging effects 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) and; therefore, is acceptable.

4.8 Conclusion for Time-Limited Aging Analyses

The staff reviewed the information in LRA Section 4, "Time-Limited Aging Analyses." On the basis of its review, the staff concludes**,** that the applicant has provided a sufficient list of TLAAs, as defined in 10 CFR 54.3 and that the applicant has demonstrated that: (1) the TLAAs will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i); (2) the TLAAs have been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii); or (3) that the effects of aging on intended function(s) will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the UFSAR supplement for the TLAAs and finds that the supplement contains descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). 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 licenses will continue to be conducted in accordance with the CLB, and that any changes made to the CLB, in order to comply with 10 CFR 54.29(a), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

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SECTION 5

REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10, Part 54, of the *Code of Federal Regulations*, the Advisory Committee on Reactor Safeguards (ACRS) will review the license renewal application (LRA) for Susquehanna Steam Electric Station, Units 1 and 2. The ACRS Subcommittee on Plant License Renewal will continue its detailed review of the LRA after this safety evaluation report (SER) is issued. PPL Susquehanna, LLC (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 Susquehanna Steam Electric Station, Units 1 and 2, in accordance with NRC regulations and NUREG-1800, Revision 1, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” dated September 2005. Title 10, Section 54.29, of the *Code of Federal Regulations* (10 CFR 54.29) sets the standards for issuance of a renewed license.

On the basis of its review of the LRA, the staff 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),” Supplement 35 “Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Susquehanna Steam Electric Station, Units 1 and 2, Final Report” is scheduled to be issued in April 2009.

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APPENDIX A

SSES UNITS 1 AND 2 LICENSE RENEWAL COMMITMENTS

During the review of the Susquehanna Steam Electric Station (SSES), Units 1 and 2, license renewal application (LRA) by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff), PPL Susquehanna, LLC (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.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
1) Inservice Inspection (ISI) Program	Existing program is credited.	A.1.2.23	Ongoing
2) BWR Water Chemistry Program	Existing program is credited.	A.1.2.11	Ongoing
3) Reactor Head Closure Studs Program	Existing program is credited.	A.1.2.40	Ongoing
4) BWR Vessel ID Attachment Welds Program	Existing program is credited.	A.1.2.9	Ongoing
5) BWR Feedwater Nozzle Program	Existing program is credited.	A.1.2.6	Ongoing
6) BWR CRD Return Line Nozzle Program	Existing program is credited. • PPL will implement weld overlay repairs in accordance with ASME Section XI and NRC-approved Code Cases. If no NRC-approved Code Case exists for the weld overlay, PPL will obtain NRC approval prior to implementing the repair in accordance with 10 CFR 50.55a.	A.1.2.5	Ongoing

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
7) BWR Stress Corrosion Cracking (SCC) Program	Existing program is credited.	A.1.2.8	Ongoing
8) BWR Penetrations Program	Existing program is credited.	A.1.2.7	Ongoing
9) BWR Vessel Internals Program	Existing program is credited. • PPL will continue to perform inspections on at least 10% of the top guide grid beam cells containing control rod drives/blades every twelve years during the period of extended operation. Inspections on at least 5% of the top guide locations will be performed within the first six years of each twelve year interval. The top guide locations to be inspected are those subject to neutron fluence levels that exceed the IASCC threshold of 5.0E+20 n/cm^2. The inspections will be performed using the enhanced visual inspection technique, EVT-1.	A.1.2.10	Ongoing

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
10) Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program	Program is new. The new program for SSES will be consistent with the program described in NUREG-1801 Section XI.M13, Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS) Program. The SSES program will identify susceptible components, evaluate those components to determine their susceptibility to loss of fracture toughness, and examine those components that are evaluated to be susceptible.	A.1.2.48	Prior to the period of extended operation.
11) Flow-Accelerated Corrosion (FAC) Program	Existing program is credited.	A.1.2.20	Ongoing
12) Bolting Integrity Program	Existing program is credited with the following enhancement: • Include specific precautions against the use of sulfur (sulfide) containing compounds as a lubricant for bolted connections.	A.1.2.2	Prior to the period of extended operation
13) Piping Corrosion Program	Existing program is credited with the following enhancements*:* • Include the Standby Gas Treatment System loop seals within the scope of the program. • Incorporate performance, documentation and trending of opportunistic visual inspections (during normal maintenance/repair activities) in addition to existing Piping Corrosion Program inspections.	A.1.2.38	Prior to the period of extended operation.
14) Crane Inspection Program	Existing program is credited.	A.1.2.17	Ongoing

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
15) Fire Protection Program	Existing program is credited.	A.1.2.18	Ongoing
16) Buried Piping Surveillance Program	Program is new. The scope of the Buried Piping Surveillance Program includes only the portions of the buried piping in the Residual Heat Removal Service Water (RHRSW) and Emergency Service Water (ESW) common return header known to have damaged coatings. The program is credited for managing loss of material due to crevice, general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel piping components with damaged coatings.	A.1.2.4	Prior to the period of extended operation.
17) Condensate and Refueling Water Storage Tanks Inspection	Program is a new one-time inspection. The scope of the Condensate and Refueling Water Storage Tanks Inspection includes the base (bottom surface and foundation pad interface) of the Condensate Storage Tanks (CSTs) and Refueling Water Storage Tank (RWST) that are in the scope of license renewal and included in the Condensate Storage and Transfer and the Refueling Water Storage and Transfer systems. An appropriate combination of volumetric (including thickness measurement) and visual examinations will be conducted, for a unit's CST (or RWST), to detect evidence of a loss of material due to crevice, general, or pitting corrosion or to confirm a lack thereof. Results will be applied to the other unit's tank(s) based on engineering evaluation.	A.1.2.14	Within the 10-year period prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
18) Reactor Vessel Surveillance Program	Existing program is credited with the following enhancement: • Address the additional requirements specified in the NRC safety evaluation dated March 1, 2006, for BWRVIP-116. The program will include a requirement that, if a standby capsule is removed from either of the SSES Unit 1 or UNIT 2 reactor vessels without the intent to test it, the capsule will be stored in a manner which maintains it in a condition which would permit its future use, including during the period of extended operation if necessary.	A.1.2.41	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
19) Chemistry Program Effectiveness Inspection	Program is a new one-time inspection. The Chemistry Program Effectiveness Inspection includes the internal surfaces of aluminum, copper and copper alloy, carbon and low alloy steel, cast iron, stainless steel, and nickel alloy components in systems that contain treated water or fuel oil. A representative sample of components in low flow and stagnant areas (i.e., locations that are isolated from the flow stream and possibly prone to gradual accumulation/concentration of contaminants) will be examined for evidence of a loss of material (due to crevice, galvanic, general, or pitting corrosion or to erosion, and to MIC in fuel oil), or to confirm a lack thereof, and the results applied to the rest of the system(s) based on engineering evaluation.	A.1.2.12	Within the 10-year period prior to the period of extended operation.
20) Cooling Units Inspection	Program is a new one-time inspection. The Cooling Units Inspection activities focus on a representative sample population of subject components at susceptible locations, to be defined in the implementing documents. These inspection activities provide symptomatic evidence of cracking, loss of material, or reduction in heat transfer at all other susceptible locations due to the similarities in materials and environmental conditions.	A.1.2.16	Within the 10-year period prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
21) Heat Exchanger Inspection	Program is a new one-time inspection. The Heat Exchanger Inspection detects and characterizes conditions to determine whether, and to what extent a loss of heat transfer due to fouling is occurring (or likely to occur) for heat exchangers within the scope of license renewal. The Heat Exchanger Inspection is also credited for managing cracking due to stress corrosion cracking / inter-granular attack in the treated water (internal) environment of the admiralty brass tubes.	A.1.2.22	Within the 10-year period prior to the period of extended operation.
22) Main Steam Flow Restrictor Inspection	Not Used	Not Used	Not Used
Not Used			

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
23) Monitoring and Collection System Inspection	Program is a new one-time inspection. The scope of the Monitoring and Collection System Inspection includes the internal surfaces of subject carbon steel (and low alloy steel) and cast iron piping and valve bodies that are exposed to potentially radioactive drainage water (untreated water) and potentially other contaminants/fluids during normal plant operations. A representative sample of components in the system, to be defined in the implementing documents, and to include containment isolation piping and/or valve bodies, will be examined for evidence of a loss of material (due to crevice, general, or pitting corrosion or to MIC), or to confirm a lack thereof, and the results applied to the rest of the system based on engineering evaluation.	A.1.2.33	Within the 10-year period prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
24) Supplemental Piping/Tank Inspection	Program is a new one-time inspection. The Supplemental Piping/Tank Inspection is credited for managing loss of material due to crevice and pitting corrosion on carbon steel surfaces at air-water interfaces. The inspection is also credited for managing loss of material due to microbiologically influenced corrosion (MIC) at the air-water interface with the mist eliminator loop seal, which is filled with raw water from the Service Water System, and galvanic corrosion at points of contact between the mist eliminator housing and the SGTS filter enclosure, where condensation and water pooling may occur. Additionally, the Supplemental Piping/Tank Inspection detects and characterizes whether, and to what extent, a loss of material due to crevice and pitting corrosion is occurring (or is likely to occur) for stainless steel surfaces at air-water interfaces. The Supplemental Piping/Tank Inspection also detects and characterizes loss of material due to crevice, galvanic, general, and pitting corrosion on internal carbon steel surfaces within the scram discharge volume (piping and valve bodies) of the Control Rod Drive Hydraulic System, within the air space of the condensate storage tanks and within the Diesel Generator starting air receiver tanks and E diesel compressor skid air receiver tanks to determine whether, and to what extent, degradation is occurring (or is likely to occur). In addition, the Supplemental Piping/Tank Inspection is credited to detect and characterize loss of material due to general, crevice, and pitting corrosion on the internal surfaces of carbon steel and cast iron diesel exhaust piping, piping components, and turbocharger casings. The inspection is also credited to detect and characterize cracking and loss of material due to crevice and pitting corrosion on the internal surfaces of stainless steel diesel exhaust piping components.	A.1.2.46	Within the 10-year period prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
25) Selective Leaching Inspection	Program is a new one-time inspection. The Selective Leaching Inspection detects and characterizes conditions to determine whether, and to what extent a loss of material due to selective leaching is occurring (or likely to occur) for susceptible components including piping and tubing, valve bodies, pump and turbocharger casings, heat exchanger, cooler, and chiller components, hydrants, sprinkler heads, strainers, level gauges, orifices, and heater sheaths. The components within the scope of the program are formed of cast iron, brass, bronze, and copper alloy materials. The components are subject to raw water, treated water, groundwater (buried), indoor air with condensation, outdoor air, and fuel oil environments. The components within the scope of this program are located in twenty-six different plant systems.	A.1.2.43	Within the 10-year period prior to the period of extended operation.
26) Buried Piping and Tanks Inspection Program	Program is new. The scope of the Buried Piping and Tanks Inspection Program includes buried components that are within the scope of license renewal for SSES. The program is credited for managing loss of material due to crevice~~,~~ general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel piping components. In addition, the program is credited with managing loss of material for buried stainless steel piping components. The Buried Piping and Tanks Inspection Program is also credited for managing loss of material due to crevice, general, and pitting corrosion and microbiologically influenced corrosion (MIC) for buried steel tanks in the Diesel Fuel Oil System.	A.1.2.3	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
27) Small-Bore Class 1 Piping Inspection	Program is a new one-time inspection. The SSES program will include measures to verify that ***c***racking is not occurring in Class 1 small-bore piping, thereby validating the effectiveness of the Chemistry Program to mitigate cracking and confirming that no additional aging management programs are needed for the period of extended operation.	A.1.2.44	Within the 10-year period prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
28) System Walkdown Program	Existing program is credited with the following enhancements: • The governing procedure for the System Walkdown Program must be revised to add the listing of systems crediting the program for license renewal and to explicitly include inspection of other metals, copper alloy and stainless steel. o It may be determined by engineering evaluation that these components do not require monitoring every two weeks, and the basis for a different walkdown frequency must be documented on the appropriate procedure form. • The governing procedure for the System Walkdown Program must be enhanced to address the license renewal requirement for opportunistic inspections of normally inaccessible components (e.g., those that are insulated), and those that are accessible only during refueling outages. For underground vaults/pits/manholes, an initial sample of at least one vault/pit/manhole from each grouping of components with identical material and environment combinations will be inspected prior to entering the period of extended operation. A representative sample of the entire population will be inspected within the first 6 years of the period of extended operation. Results of the inspection activities that require further engineering evaluation/resolution (e.g., sample expansion and inspection frequency changes if degradation is detected), if any, will be evaluated using the SSES corrective action process. • The governing procedure for the System Walkdown Program will be enhanced to include a visual and ultrasonic inspection of the external surfaces of piping passing into structures through penetrations (underground piping) for those penetrations with a history of leakage. These inspections will be focused on penetrations that are leaking at that time and will include a representative population of each material, environment combination from those piping systems within the scope of license renewal (which includes those for the RHRSW, ESW, and Fire Protection systems) that enter structures below grade.	A.1.2.47	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
29) Inservice Inspection (ISI) Program – IWE	Existing program is credited.	A.1.2.24	Ongoing
30) Inservice Inspection (ISI) Program – IWF	Existing program is credited.	A.1.2.25	Ongoing
31) Inservice Inspection (ISI) Program - IWL	Existing program is credited.	A.1.2.26	Ongoing
32) Containment Leakage Rate Test Program	Existing program is credited.	A.1.2.15	Ongoing
33) Masonry Wall Program	Existing program is credited with the following enhancement: • Specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking and steel degradation is sufficient to invalidate the evaluation basis.	A.1.2.31	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
34) Structures Monitoring Program	Existing program is credited with the following enhancements: • Include additional structures requiring aging management for license renewal to the scope of the inspections. • Specify that if a below grade structural wall or structural component becomes accessible through excavation; a follow-up action is initiated for the responsible engineer to inspect the exposed surfaces for age-related degradation. • Clarify “structural component” for inspection includes each of the component types identified as requiring aging management. • Include degradation mechanisms for elastomer and earthen embankment inspection. • Include RG 1.127 inspection elements for water-control structure. • Specify that the responsible engineer shall review site groundwater and raw water pH, chlorides, and sulfates results prior to inspection to validate that the below-grade or raw water environment remain non-aggressive during the period of extended operation. • Specify that for each masonry wall, the extent of observed masonry cracking and/or degradation of steel edge supports/bracing is evaluated to ensure that the current evaluation basis is still valid. Corrective action is required if the extent of masonry cracking and steel degradation is sufficient to invalidate the evaluation basis. • Include additional direction for quantifying, monitoring and trending of inspection results; Include additional guidance for inspection reporting, data collection and documentation; Specify acceptance criteria and critical parameters to monitor degradation and to trigger level of inspection and initiation of corrective action; and provide better alignment with referenced Industry codes, standards and guidelines. • Include specific qualification requirements for the inspector.	A.1.2.45	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
35) RG 1.127 Water-Control Structures Inspection	Existing program is credited with the following enhancements: • Add the Spray Pond (including concrete liner, emergency spillway, riser encasements and earthen embankments) to its scope for inspection. • Include RG 1.127 Revision 1 Section C.2 inspection elements and degradation mechanisms for water-control structure inspection. • Include acceptance criteria as delineated in NUREG-1801 Section XI.S7 for water-control structures. Evaluation criteria provided in Chapter 5 of ACI 349.3R-96 provides acceptance criteria (including quantitative criteria) for determining the adequacy of observed aging effects and specifies criteria for further evaluation.	A.1.2.42	Prior to the period of extended operation.
36) Non-EQ Electrical Cables and Connections Visual Inspection Program	Program is new. The Non-EQ Electrical Cables and Connections Visual Inspection Program is credited with detecting aging effects from adverse localized environments in non-EQ cables and connections at SSES. The program is applicable to non-EQ cables and connections found in the Reactor Buildings, Circulating Water Pumphouse and Water Treatment Building, Control Structure, Diesel Generator Buildings, Turbine Building, Engineered Safeguards Service Water Pumphouse, and various yard structures (manholes, duct banks, valve vaults, instrument pits, etc.). This program is also applicable to the cables and connections within the scope of license renewal located in the yard areas and control cubicles of the T10 230 kV Switchyard, the 500 kV Switchyard, and the 230 kV Switchyard.	A.1.2.35	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
37) Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program	Program is new. The Non-EQ Cables and Connections Used in Low-Current Instrumentation Circuits Program is credited with identifying aging effects for sensitive, high-voltage, low-current signal applications that are in-scope for license renewal at SSES. These sensitive circuits are potentially subject to reduction in insulation resistance (IR) when found in adverse localized environments.	A.1.2.34	Prior to the period of extended operation.
38) Non-EQ Inaccessible Medium-Voltage Cables Program	Program is new. The Non-EQ Inaccessible Medium-Voltage Cables Program involves two parts: first, the actions to inspect the applicable plant manholes (and to drain them, if necessary) on a periodic basis; and second, the development of a testing program to confirm that the conductor insulation on the applicable cables is not degrading. This program applies to six cables associated with the offsite power supply for SSES. These are the only inaccessible medium-voltage cables at SSES that are within the scope of license renewal and are exposed to significant moisture simultaneously with significant voltage.	A.1.2.36	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
39) Metal-Enclosed Bus Inspection Program	Program is new. The Metal-Enclosed Bus Inspection Program is credited with detecting aging effects for in-scope metal-enclosed bus at SSES. The applicable components for the metal-enclosed bus will be listed in the program implementing document(s), with their locations specified, as appropriate. The in-scope bus is limited to non-segregated metal-enclosed bus in the 13.8 kV and 4 kV electrical systems associated with the off-site power supply at SSES.	A.1.2.32	Prior to the period of extended operation.
40) Area-Based NSAS Inspection	Program is a new one-time inspection. The Area-Based NSAS Inspection includes confirming the environmental and/or internal surfaces conditions of subject nonsafety-related carbon steel (includes low alloy steel), cast iron, copper alloy and stainless steel components in systems that (frequently or continuously during normal plant operations) contain raw water, potable water, non-radioactive equipment/area drainage water, or in some select cases, treated water. The program is plant-specific.	A.1.2.1	Within the 10-year period prior to the period of extended operation.
41) Leak Chase Channel Monitoring Activities	The existing program is credited. The program is plant-specific.	A.1.2.27	Ongoing

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
42) Preventive Maintenance Activities – RCIC/HPCI Turbine Casings	Existing program is credited with the following enhancements: • Include a specific step to perform a visual inspection of the RCIC turbine casing. • Add requirements to have inspections performed by qualified personnel using VT-3 or equivalent inspection methods, and to document and trend inspection results. • Establish specific acceptance criteria for inspection results. The program is plant-specific.	A.1.2.39	Prior to the period of extended operation

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
43) Fatigue Monitoring Program	Existing program is credited with the following enhancements: • Provisions will be made in the Fatigue Monitoring Program to validate that components which have satisfied ASME Section III, Paragraph N-415.1 requirements (i.e., RPV nozzles N6A, N6B, and N7) continue to satisfy these requirements prior to and during the period of extended operation, thereby allowing fatigue to be continued to be addressed under N-415.1. • The Fatigue Monitoring Program will be enhanced to ensure that the fatigue usage at all monitored locations, including those locations that account for the effect of the reactor water environment, is managed such that an adequate margin against fatigue cracking is maintained. PPL will implement one or more of the following actions, if fatigue usage at a monitored location, including any location that accounts for the effect of the reactor water environment, is projected to reach the design basis limit prior to the end of the period of extended operation: 1. Further refinement of the fatigue analyses to lower the CUFs to less than the allowable; 2. Repair of the affected components; 3. Replacement of the affected components; 4. Management by an inspection program that has been reviewed and approved by the NRC. • The Fatigue Monitoring Program will be enhanced to include the review of Class 1 valve fatigue analyses and other fatigue-related TLAA, such as flued head analyses and high energy line break evaluations, when sufficient fatigue accumulation has occurred, to determine if additional actions are required to address fatigue-related concerns. • The Fatigue Monitoring Program will be enhanced to include fatigue monitoring of the additional locations required to bound the limiting locations applicable to SSES, as identified in NUREG/CR-6260	A.1.2.49	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
44) Environmental Qualification (EQ) Program	Existing program is credited. For those EQ components that do not show a minimum 60-year life, the EQ Program will ensure qualified life is not exceeded by directing refurbishment, replacement, or reanalysis to extend the qualification.	A.1.3.4	Ongoing
45) Closed Cooling Water Chemistry Program	Existing program is credited.	A.1.2.13	Ongoing.
46) Fire Water System Program	Existing program is credited with the following enhancements: • The Fire Water System Program will be revised to incorporate sprinkler head sampling/replacements, in accordance with NFPA 25. • The Fire Water System Program will be revised to incorporate ultrasonic testing of representative above ground portions of water suppression piping that are exposed to water but which do not normally experience flow, are associated with a dry-pipe sprinkler system and may contain stagnant water, or is pre-action or deluge piping that is normally dry but may have been wetted and not completely dried. • Perform at least one visual inspection (opportunistic or focused) of the internal surface of buried fire water piping, within the 10 year period prior to the period of extended operation. • Perform at least one inspection per year of 'wet' fire protection piping for wall thickness and pipe blockage, if no opportunistic inspection has been completed.	A.1.2.19	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
47) Fuel Oil Chemistry Program	Existing program is credited.	A.1.2.21	Ongoing
48) Lubricating Oil Analysis Program	Existing program is credited with the following enhancement**s**: • The Lubricating Oil Analysis Program will be enhanced to include sampling of the lubricating oil from the Control Structure Chiller and Diesel Engine Driven Fire Pump when the oil is changed. The oil will be tested for water and for particle count. • The Lubricating Oil analysis Program will be revised to include sampling of the lubricating oil from the Reactor Building Chiller when the oil is changed. The oil will be tested for water and particle count.	A.1.2.28	Prior to the period of extended operation.
49) Lubricating Oil Inspection	Program is a new one-time inspection. The Lubricating Oil Inspection detects and characterizes the condition of materials in systems and components for which the Lubricating Oil Analysis Program is credited with aging management. The inspection provides direct evidence as to whether, and to what extent, a loss of material or a reduction in heat transfer due to fouling has occurred.	A.1.2.29	Within the 10-year period prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
50) Non-EQ Electrical Cable Connections Program	Program is new. The Non-EQ Electrical Cable Connections Program manages the aging for the metallic parts of non-EQ electrical cable connections within the scope of license renewal. The program addresses cable connections that are used to connect cable conductors to other cables or electrical devices. Aging management for the metallic parts of the non-EQ electrical cable connections that are subject to aging stressors will be provided by testing.	A.1.2.37	Prior to the period of extended operation.
51) New P-T Curves	Revised Pressure-Temperature (P-T) limits will be submitted to the NRC for approval when necessary to comply with 10 CFR 50 Appendix G.	A.1.3.1.4	Ongoing
52) OE Review at EPU Conditions	Perform an Operating Experience (OE) review for the period of operation at EPU conditions and its impact on aging management programs for systems, structures and components (SSCs).	---------	Prior to the period of extended operation.
53) Incorporate FSAR Supplement	Incorporate FSAR Supplement into the SSES FSAR as required by 10 CFR 54.21(d)	A.1.1	Following issuance of the renewed operating licenses
54) Re-apply for relief request	PPL will process a relief request for circumferential vessel shell weld volumetric examinations for the period of extended operation.	A.1.3.1.5	Prior to the period of extended operation.

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
55) Core Hold Down Bolts	PPL will either (1) obtain NRC approval of a SSES plant specific evaluation consistent with BWRVIP-25 to demonstrate that the core plate rim hold-down bolts will be capable of preventing lateral displacement of the core plate for the period of extended operation, the plant specific evaluation will be submitted for NRC review no less than 2 years prior to the period of extended operation and will address the inspection strategy for the hold-bolts, or (2) install core plate wedges to structurally replace lateral load resistance provided by the bolts.	A.1.3.6.3	Prior to the period of extended operation.
56) BWRVIP-76	PPL will address any future conditions, requirements, or limitations imposed by the NRC's safety evaluation for license renewal for BWRVIP-76.	A.1.3.6.4	Prior to the period of extended operation.
57) Preventative Maintenance Activities-Main Turbine Casing	Existing program is credited with the following enhancement: • Specify that the inspection of the high pressure turbine shell will consist of a visual inspection (VT-3 or equivalent) of accessible surfaces and an ultrasonic examination of selected locations for wall thickness. The program is plant specific.	A.1.2.50	Prior to the period of extended operation.
58) Activities in Response to NRC Generic Letter 88-14	Activities credited in the SSES response to NRC Generic Letter 88-14 will be continued throughout the period of extended operation.	---------	Ongoing

Table A-1

SSES License Renewal Commitments

Item Number	Commitment	UFSAR Supplement Location (LRA App. A)	Enhancement or Implementation Schedule
59) Fuse Holders Program	Program is new. The Fuse Holders Program is credited with identifying increased connection resistance between the fuse holder metallic clamp and fuse due to fatigue of the metallic clamp. The program provides for periodic inspection of fuse holder clamps within the scope of license renewal that are not in enclosures containing active components and whose fuses are scheduled for removal once every 12 months, or more frequently.	A.1.2.51	Prior to the period of extended operation
60) Activities in Response to NRC Concerns Regarding Fatigue Analyses	PPL will either (1) implement fatigue monitoring software that satisfactorily addresses all issues raised in the proposed Regulatory Information Summary (RIS), “Fatigue Analysis of Nuclear Power Plant Components,” May 1, 2008 (73 FR 24094), or (2) perform a confirmatory ASME Code, Section III fatigue evaluation for the SBF-monitored locations to justify the existing FatiguePro methodology used at SSES Units 1 and 2.	-----------	Prior to the period of extended operation.

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 PPL Susquehanna, LLC (PPL). This appendix also lists other correspondence on the staff's review of the Susquehanna Steam Electric Station (SSES), Units 1 and 2 license renewal application (LRA) (under Docket Nos. 50-387 and 50-388).

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Date	**Subject**
09/13/2006	Letter from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Units 1 and 2., License Renewal Application, ", (ML062620157)
09/20/2006	Press Release, NRC/OPA, "Press Release-06-115: NRC Announces Availability of License Renewal Application for Susquehanna Steam Electric Station, Units 1 and 2.," (ML062630232)
09/26/2006	Federal Register Notice Letter, from Gillespie F P, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Receipt and Availability of the License Renewal Application for the Susquehanna Steam Electric Station.," , (ML062690158)
10/11/2006	Letter Technical Specification, Bases Change Technical Specifications, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Proposed License Amendment Numbers 285 for Unit 1 And 253 for Unit 2, Constant Pressure Power Uprate.," , (ML062900160)
10/26/2006	Federal Register Notice Letter, from Gillespie F P, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding the Application from PPL Susquehanna, LLC., for renewal of the Operating Licenses for the Susquehanna Steam Electric Station," , (ML062930293)
10/31/2006	Press Release, NRC/OPA, "Press Release-06-138: NRC Announces Opportunity to Request a Hearing on License Renewal Application for Susquehanna Nuclear Power Plant.," , (ML063040604)

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Date	**Subject**
11/02/2006	Federal Register Notice Meeting Agenda Meeting Notice, from Mullins A, NRC/NRR/ADRO/DLR/REBB, to Franovich R L, NRC/NRR/ADRO/DLR/REBB, "11/15/2006 Notice of Forthcoming Meeting to Discuss the License Renewal Process and Environmental Scoping for Susquehanna Steam Electric Station, License Renewal Application Review.," , (ML062990010)
11/02/2006	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Acceptability and Sufficiency for Docketing - Application for Renewed Operating Licenses Numbers NPF-14 and NPF-22.," , (ML063130413)
11/06/2006	Press Release, NRC/OPA/RGN-I/FO, "Press Release-I-06-058: NRC To Discuss Process For Review of License Renewal Application For Susquehanna Nuclear Plant, Seeks Environmental Input.," , (ML063100410)
11/15/2006	Meeting Agenda, NRC/NRR, "Susquehanna Steam Electric Station 11/15/06 Environmental Scoping Meeting Agenda and Open House Welcome.," , (ML063240148)
11/15/2006	Slides and Viewgraphs, NRC/NRR, "Susquehanna Steam Electric Station 11/15/06 Environmental Scoping Meeting Slide Handouts.," , (ML063240150)
01/02/2007	Legal-Intervention Petition, Responses and Contentions, from Epstein E J, - No Known Affiliation, NRC/SECY/RAS, "2007/01/02-Susquehanna- Legal-Intervention Petition Re: PPL Susquehanna LLC Application for Susquehanna Steam Electric Station's Renewed Operating Licenses.," , (ML070170485)
01/10/2007	Legal-Intervention Petition, Responses and Contentions, from Epstein E, - No Known Affiliation, NRC/SECY, "2007/01/10- Susquehanna-Email from Eric Epstein re: Service to Parties the supplemental filing relating to SAMA requirements.," , (ML070310330)
01/12/2007	Legal-Hearing Request Referral Memorandum, from Vietti-Cook A L, NRC/SECY, to Hawkens E R, NRC/ASLBP, "2007/01/12-Memorandum fo the Secretary referring the intervention petition of Eric Joseph Espstein submitted for intervention in the Susquehanna License Renewal proceeding to the ASLBP," , (ML070170135)
01/13/2007	Rulemaking-Comment, from Epstein E, Three Mile Island Alert, Inc, NRC/SECY/RAS, "2007/01/13-Comment (1) submitted by Three Mile Island Alert,I Inc., Eric Epstein on Massachusetts Attorney General's PRM-51-10 re to Amend 10 CFR Part 51.," , (ML070180478)
01/23/2007	Legal-Order, from Young A M, NRC/ASLBP, "2007/01/23-LB ORDER (Regarding Schedule and Guidance for Proceedings)," , (ML070230569)

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Date	**Subject**
01/29/2007	Legal-Intervention Petition, Responses and Contentions, from Barkman M L Martin J C, NRC/OGC, NRC/ASLBP, "2007/01/29- Susquehanna - NRC Staff Response to Eric Joseph Epstein's Petition for Leave to Intervene, Request for Hearing and Contentions.," , (ML070300052)
01/29/2007	Legal-Intervention Petition, Responses and Contentions, from Lewis D R, Pillsbury, Winthrop, Shaw, Pittman, LLP PPL Susquehanna, LLC, NRC/ASLBP, "2007/01/29- Susquehanna - PPL Susquehanna's Answer to Eric Epstein's Petition for Leave to Intervene.," , (ML070360282)
01/31/2007	Legal-Report, from Epstein E J, Three Mile Island Alert, Inc, NRC/ASLBP, "2007/01/31- Susquehanna - Notice of Related Filing by Three Mile Island Alert Incorporated, submitted by Eric Joseph Epstein.," , (ML070370621)
02/05/2007	Legal-Intervention Petition, Responses and Contentions, from Epstein E J, - No Known Affiliation, NRC/ASLBP, "2007/02/05 - Susquehanna - Eric Joseph Epstein's Response to PPL Susquehanna's Answer and Petitioners Response to NRC Staff's Response for leave to Intervene, Request for Hearing , and Contentions.," , (ML070510363)
02/05/2007	Legal-Motion, from Epstein E J, - No Known Affiliation, NRC/ASLBP, "2007/02/05- Susquehanna - Eric Joseph Epstein's Motion to Compel PPL Susquehanna, LLC to: (1) Apply for a Direct License Transfer (Or Incorporate Modifications from an NRC Approved Transfer Into the Relicensing Application)," , (ML070470585)
02/13/2007	Legal-Motion, from Lewis D R, Pillsbury, Winthrop, Shaw, Pittman, LLP PPL Susquehanna, LLC, NRC/ASLBP, "2007/02/13- Susquehanna - PPL Susquehanna's Motion to Strike Portions of Eric Epstein's Response to Answers to Petition to Intervene.," , (ML070520456)
02/15/2007	Legal-Motion, from Martin J C, NRC/OGC, "2007/02/15 - Susquehanna - NRC Staff Response to Eric Joseph Epstein's Motion to Compel and Request for Schedular Exemption," , (ML070510031)
02/23/2007	Legal-Intervention Petition, Responses and Contentions, from Epstein E J, - No Known Affiliation, NRC/ASLBP, "2007/02/23- Susquehanna - Eric Joseph Epstein's Response to PPL Susquehanna's Motion to Strike Portions of Eric Epstein's Response to Answers to Petition to Intervene.," , (ML070610194)
02/28/2007	Legal-Order, from Young A, NRC/ASLBP, "2007/02/28-LB Order (Scheduling Telephone Conference)," , (ML070590643)
03/02/2007	Inspection Plan Letter, from Gray M, NRC/RGN-I/DRP/PB4, to McKinney B T, PPL Susquehanna, LLC, "Annual Assessment Letter - Susquehanna Steam Electric Station (Report 05000387/2007001 and 05000388/2007001).," , (ML070610580)

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Date	**Subject**
03/20/2007	Letter Request for Additional Information (RAI), from Sanabria Y D, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML070720456)
03/20/2007	Legal-Intervention Petition, Responses and Contentions, from Epstein E J, - No Known Affiliation, NRC/ASLBP, "2007/03/20- Susquehanna - Eric Joseph Epstein's Response to the NRC Staff's Motion to Strikes Portions of Eric Joseph Epstein Response to the Atomic Safety Licensing Board Panel's Request for Information.," , (ML070930609)
03/22/2007	Legal-Memorandum and Order, from Lathrop H K Sager W Young A, NRC/ASLBP, "2007/03/22-LB Memorandum and Order (Ruling on Standing and Contentions of Petitioner Eric Joseph Epstein) (LBP-07-04)," , (ML070820022)
04/17/2007	Press Release, NRC/OPA/RGN-I/FO, "Press Release-I-07-020: NRC To Discuss 2006 Assessment For Susquehanna Nuclear Plant At Public Meeting Scheduled For April 24.," , (ML071070494)
04/17/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station - Application for Renewed Operating Licenses in Response to Scoping and Screening RAI's.," , (ML071140385)
04/27/2007	Letter Schedule and Calendars, from Diaz-Sanabria Y K, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Revision of Schedule for the Conduct of the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application," , (ML071000062)
05/11/2007	Legal-Intervention Petition, Responses and Contentions, from Epstein E J, - No Known Affiliation, NRC/SECY/RAS, "Petition to Intervene with Respect to the Proposed Amendment Request for a Thermal Power Increase for the Susquehanna Steam Electric Station, Units 1 and 2," , (ML071430580)
05/16/2007	Letter Request for Additional Information (RAI), from Sanabria Y K, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information (RAI 4.1.3) for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML071270018)
06/12/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Application for Renewed Operating Licenses Numbers NPF-14 and NPF-22, Requests for Additional Information (RAI 4.1.3).," , (ML071760100)

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Date	**Subject**
06/15/2007	Meeting Summary Note to File incl Telcon Record, Verbal Comm Request for Additional Information (RAI), from Diaz-Sanabria Y, NRC/NRR/ADRO/DLR/RLRA, PPL Susquehanna, LLC, "Summary of Telephone Conference Call Held on May 29, 2007, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC, Concerning Requests for Additional Information Pertaining to the Susquehanna Steam Electric Station, Units 1 and 2, LRA.," , (ML071510549)
06/15/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Application for Renewed Operating Licenses, Responses to Environmental Audit Questions.," , (ML071790414)
06/22/2007	Letter Request for Additional Information (RAI), from Diaz-Sanabria Y K, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML071710542)
06/28/2007	Memoranda Safety Evaluation Report, from Auluck R C, NRC/NRR/ADRO/DLR/RLRB, to Lund A L, NRC/NRR/ADRO/DLR/RLRA, "Scoping and Screening Draft Safety Evaluation Report Input Regarding the PPL Susquehanna, LLC, Application for the Susquehanna Steam Electric Station, Units 1 and 2 Dated September 13, 2006.," , (ML071790336)
07/12/2007	Letter, from Lund A L, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Project Manager Change for the License Renewal Environmental Review for Susquehanna Steam Electric Station, Units 1 and 2, (TAC NOS. MD3021 and MD3022).," , (ML071920034)
07/24/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Response to Request for Additional Information in Regard to Application for Renewed Operating Licenses NPF-14 and NPF-22.," , (ML072200268)
07/25/2007	Letter, from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Revision of Schedule for the Conduct of Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application," , (ML071920267)
07/25/2007	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application (RAI 2.2-1 - 2.3.2.6-5).," , (ML071970085)

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Date	**Subject**
07/30/2007	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application (RAI 2.5-1 to RAI 2.5-2)," , (ML071970114)
08/03/2007	Letter Request for Additional Information (RAI), from Gettys E, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application RAI section 2.4.," , (ML072120507)
08/23/2007	Letter, Request for Additional Information (RAI), from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Units 1 and 2, Response to NRC Requests for Additional Information for Review of License Renewal Application (LRA) Sections 2.2 & 2.3.," , (ML072480272)
08/23/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2 - Request for Additional Information (RAI) for the Review of the License Renewal Application (LRA) Section 2.5 PLA-6261.," , (ML072540680)
08/27/2007	Letter, Meeting Summary, from Gettys E, NRC/NRR/ADRO/DLR/RLRA, "Summary of Telephone Conference Call Held on July 26, 2007, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC, Concerning Draft Requests for Additional Information Pertaining to the Susquehanna Steam Electric Station, Units 1 and 2.," , (ML072330167)
08/27/2007	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML072330234)
08/27/2007	Memoranda, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, PPL Susquehanna, LLC, "Summary of Telephone Conference Call Held on August 16, 2007, Between the US NRC and PPL Susquehanna, Concerning Request for Additional Information Pertaining to the Susquehanna, Units 1 and 2, License Renewal Application.," , (ML072330414)
08/28/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station Units 1 & 2, License Renewal Application (LRA) Section 2.4.," , (ML072490210)

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Date	**Subject**
09/05/2007	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML072360229)
09/07/2007	Letter, Meeting Summary, from Gettys E, NRC/NRR/ADRO/DLR/RLRA, PPL Susquehanna, LLC, "Summary of Telephone Conference Call Held on August 23, 2007, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC, Concerning Draft Requests for Additional Information Pertaining to the Susquehanna Steam Electric Station, Units 1 & 2.," , (ML072360232)
09/12/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Annual Amendment to the Application for Renewed Operating License Numbers NPF-14 and NPF-22 Pursuant to 10 CFR 54.21(b).," , (ML072640347)
09/17/2007	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML072490602)
09/18/2007	Meeting Summary, Request for Additional Information (RAI), from Gettys E, NRC/NRR/ADRO/DLR/RLRA, PPL Susquehanna, LLC, "08/28/2007 and 09/05/2007 Summary of Telephone Conference Calls Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC, Concerning D-RAI.," , (ML072490046)
09/18/2007	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application RAI 4.7.1.," , (ML072490110)
09/20/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station Units 1 & 2, Follow-up to Request for Additional Information for the Review of the License Renewal Application (LRA) Section 4.1.3.," , (ML072750526)
10/16/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - Request for Additional Information (RAI) for the Review of the License Renewal Application (LRA) Section 4.7.1 PLA-6289.," , (ML073030455)
10/16/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Units 1 & 2 Request for Additional Information (RAI) for the Review of the License Renewal Application (LRA) Section B.2.21.," , (ML073030487)

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Date	**Subject**
10/18/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information Regarding Review of License Application (LRA) Sections 4.2.3, 4.2.4, 4.2.5, 4.2.7 and 4.7.3.," , (ML073040282)
10/18/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Request for Additional Information (RAI) for the Review of the Susquehanna Steam Electric Station Units 1 and 2, License Renewal Application (LRA) Sections 2.2, 2.3.3, 2.3.4.," , (ML073120069)
10/24/2007	Meeting Summary, Note to File incl Telcon Record, Verbal Comm Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, Susquehanna Steam Electric Co, "09/12/2007 Summary of Telephone Conference Call with PPL Susquehanna, LLC Concerning Requests for Additional Information.," , (ML072640134)
10/24/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Requests for Additional Information - License Renewal Application (LRA) Section 2.3.3.13 RAI Follow-Up, PLA-6296.," , (ML073120062)
10/24/2007	Meeting Summary Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, PPL Susquehanna, LLC, "09/26/2007 Summary of Telephone Conference Call Between the NRC and PPL Susquehanna, LLC Concerning Requests for Additional Information Pertaining to the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML072760276)
10/24/2007	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Requests for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML072850255)
11/14/2007	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk, "Susquehanna Steam Electric Station, Requests for Additional Information - License Renewal Application (LRA) Section 2.3.1,", (ML073370551)
11/16/2007	Memoranda, Note to File incl Telcon Record, Verbal Comm Request for Additional Information (RAI), from Gettys E H, PPL Susquehanna, LLC, "Summary of Telephone Conference Call Held on October 3, 2007, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC Concerning Open Items Pertaining to the Susquehanna, Units 1 and 2, License Renewal Application.," , (ML072851110)

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12/13/2007	Memoranda Note to File incl Telcon Record, Verbal Comm Request for Additional Information (RAI), from Gettys E, NRC/NRR/ADRO/DLR/RLRA, PPL Susquehanna, LLC, "Summary of Telephone Conference Call Held on 10/03/07, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC, Concerning Fire," , (ML072880051)
12/17/2007	Final Safety Analysis Report (FSAR) Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2 - License Renewal Application, Request for Additional Information, Revised FSAR Supplement Section A.1.3.1.7, PLA-6313.," , (ML073620332)
01/03/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Submittal of Supplemental Information Related to RAI 2.3.3.27-4.," , (ML080140264)
01/22/2008	Letter, from Gettys E, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Revision of Schedule for the Conduct of Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML080110291)
02/11/2008	Meeting Summary, from Gettys E, NRC/NRR/ADRO/DLR, to McKinney B T, Susquehanna Steam Electric Co, "Summary of Telephone Conference Call Held on December 28, 2007, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC, Concerning Requests for Additional Information Pertaining to the Susquehanna Steam Electric Station, Units 1 and 2.," , (ML080140515)
05/01/2008	Letter from NRC to PPL Susquehanna, LLC Revision of Schedule for the Conduct of Review of the Susquehanna Steam Electric Station, Units 1 and 2 License Renewal Application, (ML080580119)
05/07/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, to NRC/Document Control "Susquehanna Steam Electric Station, Request for Additional Information for the Review of License Renewal Application Station Blackout Scope Addition," (ML081420028)
05/30/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna Steam Electric Station, Units 1 and 2, Request for Additional Information, Review of License Renewal Application.," (Ml081480435)
06/09/2008	Letter, License-Application for Facility Operating License (Amend/Renewal) DKT 50, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Units 1 & 2, License Renewal Application, Amendment to Section 4.2.2.," , (ML081710132)
06/10/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Unit 1 and 2, LRA., Generic RAI,",(Ml081540571)

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Date	**Subject**
06/12/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Unit 1 and 2, LRA.," , (Ml081550670)
06/13/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Unit 1 and 2, LRA.," , (ML081540668)
06/13/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna Steam Electric Station, Units 1 and 2, Request for Additional Information, Review of License Renewal Application.," , (ML081410172)
06/17/2008	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna Steam Electric Station, Units 1 and 2, Request for Additional Information, License Renewal Application.," , (ML081550515)
06/23/2008	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna, Units 1 and 2, Request for Additional Information, Review of License Renewal Application.," , (ML081650217)
06/23/2008	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML081540622)
06/30/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML081780094)
06/30/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, to NRC/Document Control "Susquehanna Steam Electric Station, Request for Additional Information for the Review of License Renewal Application, Sections B.2.11, B.2.13, B.2.16 and B.2.17 (ML081980121)
07/03/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna, Units 1 and 2, Request for Additional Information, Review of License Renewal Application.," , (ML081780698)
07/03/2008	Letter, Request for Additional Information (RAI), from Gettys E H, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal RAI.," , (ML081790066)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
07/08/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, to NRC/Document Control "Susquehanna Steam Electric Station, Request for Additional Information for the Review of License Renewal Application Appendix B, PLA-6378.," , (ML082040588)
07/08/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2, Response for Additional Information for Review of License Renewal Application (LRA) Sections B.2.39, 3.5, & 4.6.," , (ML082040626)
07/09/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 & 2, License Renewal Application.," , (ML081890503)
07/10/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna, Units 1 & 2, Request for Additional Information, Review of License Renewal Application.," , (ML081890576)
07/14/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Units 1 & 2, Response to Request for Additional Information for the Review of the Units 1 & 2, License Renewal Application (LRA) Sections B.2.1, B.2.5, B.2.7, B.2.9, and B.2.10.," , (ML082110399)
07/14/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2, Response to Request for Additional Information for the Review of License Renewal Application Sections B.2.18 and B.2.30.," , (ML082110400)
07/15/2008	Letter Request for Additional Information (RAI), from Gettys E, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Electric Station, Units 1 and 2, License Renewal Application.," , (ML081920575)
07/17/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information for the Review of License Renewal Application (LRA) Sections B.2.2, B.2.20, and B.2.22.," , (ML082120075)

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Date	**Subject**
07/23/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML081960683)
07/23/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML081970397)
07/23/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML081990316)
07/24/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information for the Review of License Renewal Application Sections B.2.19 and 3.3.2.2.6.," , (ML082190558)
07/25/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information for the Review of License Renewal Application (LRA), Sections B.2.23, B.2.24, B.2.26, B.2.27, B.2.28, B.2.31.," , (ML082200292)
07/28/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information for the Review of the License Renewal Application Sections B.2.12 and B.2.15.," , (ML082190557)
07/30/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR/RLRA, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML082100599)
08/01/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station - Request for Additional Information for the Review of Units 1 and 2, License Renewal Application (LRA) Sections B.3.1, 4.3, and 4.7.," , (ML082250450)

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Date	**Subject**
08/05/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Request for Additional Information for the Review of the License Renewal Application (LRA) Sections B.2.41, B.2.42, B.2.43, B.3.2, and 3.6.," , (ML082270204)
08/08/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information for the Review of the License Renewal Application (LRA) Sections B.2.48, 3.0.3, 3.3.1 and 3.3.2.," , (ML082400092)
08/12/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Request for Additional Information for the Review of the Susquehanna Steam Electric Station Units 1 and 2, License Renewal Application (LRA) Sections B.2.14, B.2.25, B.2.32, and B.2.33, PLA-6400.," , (ML082330526)
08/13/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna, Units 1 & 2, Request for Additional Information, Review of the License Renewal Application.," , (ML082250477)
08/15/2008	Meeting Summary Request for Additional Information (RAI), from Gettys E H, NRC/NRR/ADRO/DLR, "07/25/2008 Summary of Telephone Conference Call Between NRC and PPL Susquehanna, LLC, Concerning Draft Request for Additional Information Pertaining to the Susquehanna , Units 1 & 2 License Renewal Application.," , (ML082210375)
08/15/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2, Response to Request for Additional Information for the Review of License Renewal Application (LRA) Sections 3.1, 3.2, 3.3, and 3.4.," , (ML082400534)
08/22/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information for the Review of the License Renewal Application, Sections B.2.13, B.2.17, 3.x, 3.2.2, 3.3.2, and 3.5.2.," , (ML082480042)
08/22/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - Request for Additional Information for the Review of License Renewal Application (LRA) Sections 3.3, B.2.6 and B.2.49.," , (ML082480043)

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Date	**Subject**
08/22/2008	Meeting Summary,Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, PPL Susquehanna, LLC, "08/07/08, Summary of Telephone Conference Call Held Between the NRC and PPL Susquehanna, LLC., Concerning Draft's Pertaining to the Susquehanna Steam Electric Station, Units 1 & 2, License Renewal Application.," , (ML082260181)
08/27/08	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk Susquehanna, Units 1 & 2, Response to Request for Additional Information for the Review of the License Renewal Application (LRA) Sections B.2.8, B.2.9, 3.1.2, 3.2.2, 3.3.2, & 3.4.2 (ML082480294)
08/29/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2, Response to Request for Additional Information for the Review of the License Renewal Application (LRA) Section 2.5.," , (ML082610435)
09/11/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Units 1 & 2 - Request for Additional Information for the Review of License Renewal Application Supplemental Response to RAI's B.2.31-5 and B.2.31-6, PLA-6419.," , (ML082670889)
09/23/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, to McKinney B T, PPL Susquehanna, LLC, "RAI for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, LRA RAI on Sun (1).," , (ML082530102)
09/23/2008	Letter, License-Application for Facility Operating License (Amend/Renewal) DKT 50, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Units 1 & 2 - License Renewal Application (LRA) Amendments to Sections B.2.38, B.2.39, and B.2.47 in Response to NRC Regional Inspection PLA-6427.," , (ML083030165)
09/26/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, License Renewal Application (LRA) Amendments to LRA and RAI Responses.," , (ML082950012)
09/26/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2 - Second Annual Amendment to the Application for Renewed Operating License Numbers NPF-14 and NPF-22 Pursuant to 10 CFR 54.21(b), PLA-6429.," , (ML082950013)

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Date	**Subject**
09/30/2008	Letter, License-Application for Facility Operating License (Amend/Renewal) DKT 50, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Units 1 & 2 - Licensee Renewal Application Amendments to Sections 2.1.1, B.2.14, B.2.22, B.2.28, B.2.28, B.2.31, and B.2.46 in Response to NRC Regional Inspection PLA-6428.," , (ML082950011)
10/01/2008	Meeting Summary Memoranda Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, PPL Susquehanna, LLC, "06/25/2008 Meeting Summary, Telephone Conference Call Between the NRC and PPL Susquehanna, LLC, Concerning Draft Request for Additional Information Pertaining to the Susquehanna, Units 1 and 2, License Renewal Application.," , (ML082260353)
10/17/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, to McKinney B T, PPL Susquehanna, LLC, "Susquehanna, Units 1 and 2, Request for Additional Information, Review of the License Renewal Application.," , (ML082800066)
10/17/2008	Meeting Summary Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, PPL Susquehanna, LLC, "09/15/2008- Summary of Telephone Conference Call Between US NRC and PPL Susquehanna, LLC, Concerning Draft Request for Additional Information Pertaining to the Susquehanna Steam Electric Station, Units 1 & 2, License Renewal Application.," , (ML082800439)
10/17/2008	Meeting Summary Request for Additional Information (RAI), from Gettys E, NRC/NRR/DLR/RPB1, "09/18/2008 Meeting Summary, Meeting Between the NRC and PPL Susquehanna, LLC., Concerning Requests for Additional Information Responses Pertaining to the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML082820577)
10/21/2008	Meeting Summary Memoranda, from Gettys E, NRC/NRR/DLR/RPB1, "Summary of Telephone Conference Call Held on October 8, 2008, Between the USNRC and PPL Susquehanna, LLC. Concerning Draft Requests for Additional Information Pertaining to the, License Renewal Application.," , (ML082890152)
10/21/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station Units 1 and 2, License Renewal Application (LRA) Amendments to Sections B.2.13, B.2.17, B.2.20, B.2.22, B.2.28, B.2.32, and B.2.48 in Response to NRC Regional Inspection.," , (ML083181108)

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Date	**Subject**
10/22/2008	Letter, Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 & 2, License Renewal Application.," , (ML082831712)
10/22/2008	Letter, from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - Response to Request for Additional Information for the Review of License Renewal Application Section B.2.12.," , (ML083190019)
10/26/2008	Letter, from , from McKinney B T, PPL Susquehanna, LLC, NRC/Document Control Desk Amendments to Sections B.2.13, B.2.17, B.2.20, B.2.22, B.2.28, B.2.32, AND B.2.48 in Response to NRC Regional Inspection
10/27/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, to McKinney B T, PPL Susquehanna, LLC, "Request for Additional Information for the Review of the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML082890340)
11/03/2008	Meeting Summary, from Gettys E, NRC/NRR/DLR/RPB1, PPL Susquehanna, LLC, "Summary of Telephone Conference Call Held on Sept 24, 2008, Between the U.S. NRC and PPL Susquehanna, LLC., Concerning Draft Requests for Additional Information Pertaining to the SSES, Units 1 and 2, License Renewal Application.," , (ML083030591)
11/04/2008	Letter, from Spence W H, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - Response to Request for Additional Information for the Review of the License Renewal Application (LRA) Section 3.5.2.3.10 Follow-up to PLA-6407.," , (ML083190052)
11/04/2008	Letter, from Spence W H, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information for the Review of License Renewal Application, Section B.2.12 Followup to PLA-6436.," , (ML083190053)
11/11/2008	Letter, from Spence W H, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2, Request for Additional Information Related to License Renewal Application Sections B.2.8 and B.2.32.," , (ML083300358)

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Date	**Subject**
11/11/2008	Letter, from Spence W H, PPL Corp PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station, Request for Additional Information for the Review of the Susquehanna Steam Electric Station Units 1 and 2, License Renewal Application (LRA) Follow-Up to PLA-6398 Responses PLA-6442.," , (ML083300392)
11/17/2008	Letter License-Application for Facility Operating License (Amend/Renewal) DKT 50, from Spence W H, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 & 2, License Renewal Application Change to Aging Management Program B.2.30.," , (ML083370200)
11/17/2008	Letter, from Spence W H, PPL Corp, PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Request for Additional Information for the Review of License Renewal Application, Section B.2.1 - Questions and Responses.," , (ML083370201)
11/19/2008	Meeting Summary Note to File incl Telcon Record, Verbal Comm, from Gettys E, NRC/NRR/DLR/RPB1, "Summary of Telephone Conference Call Held on October 10, 2008, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC., Concerning the Responses to Requests for Additional Information Pertaining to the Susquehanna Steam.....," , (ML083220947)
11/19/2008	Meeting Summary Memoranda Note to File incl Telcon Record, Verbal Comm, from Gettys E H, NRC/NRR/DLR/RPB1, PPL Susquehanna, LLC, "11/13/2008-Summary of Telephone Conference Call Between NRC and PPL, Concerning the Responses to RAIs Pertaining to the Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML083230786)
11/24/2008	Memoranda Request for Additional Information (RAI), from Rahimi M, NRC/NRR/DSS/SBPB, to Pelton D L, NRC/NRR/DLR/RPB1, "Request for Additional Information License Renewal Application for Susquehanna Steam Electronic Station Units 1 and 2, Section 2.3.3.18 (TAC MD3019 and MD3020).," , (ML083250030)
11/25/2008	Letter License-Application for Facility Operating License (Amend/Renewal) DKT 50, from Spence W H, PPL Corp, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - License Renewal Application (LRA) Amendments to LRS and RAI Responses.," , (ML083440316)

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Date	**Subject**
11/26/2008	Letter, from Spence W H, PPL Corp PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - Request for Additional Information for the Review of License Renewal Application (LRA) Section 4.3.," , (ML083500379)
11/26/2008	- No Document Type Applies, PPL Corp PPL Susquehanna, LLC, NRC/NRR, "Enclosure 1 to PLA-6441 Proprietary Response to NRC's Request for Additional Information (RAI).," , (ML083500380)
12/03/2008	Meeting Summary Memoranda Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, PPL Susquehanna, LLC, "11/19/2008 Meeting Summary, Telephone Conference Call Between U.S. NRC and PPL Susquehanna, LLC, Concerning The Draft Request For Additional Information Pertaining To The Susquehanna Steam Electric Station Units 1 & 2, LRA.," , (ML083310113)
12/03/2008	Letter Request for Additional Information (RAI), from Gettys E H, NRC/NRR/DLR/RPB1, to Spence W H, PPL Susquehanna, LLC, "Request For Additional Information For The Review Of The Susquehanna Steam Electric Station, Units 1 and 2, License Renewal Application.," , (ML083310144)
12/11/2008	Letter, from Spence W H, PPL Corp PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - License Renewal Application Supplemental Response to RAI B.2.14-2.," , (ML083590280)
12/12/2008	Letter, from Spence W H, PPL Corp PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2, Response to Request for Additional Information, for Licence Renewal Application (LRA) Section 2.3.3.18.," , (ML083640308)
12/12/2008	Letter, from Spence W H, PPL Corp PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station - Request for Additional Information, and License Renewal Application (LRA) Section 4.3 Supplement.," , (ML083640309)
12/29/2009	Letter, from Spence W H, PPL Corp PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna, Units 1 and 2 - License Renewal Application Admendment to LRA PLA-6469,”, (ML090220202)
01/07/2009	Press Release, NRC/OPA/RGN-I/FO, "Press Release-I-09-002: NRC to Discuss Results of License Renewal Inspection for Susquehanna Nuclear Power Plant on Jan. 13.," , (ML090070628)

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Date	**Subject**
01/12/2009	Letter, from Spence W H, PPL Corp PPL Susquehanna, LLC, NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station Units 1 and 2 License Renewal Application.Amendment for Address Aging of Emergency Diesel Genreator Exhauset" (ML090290060)
1/16/2009	Audit Report from Gettys E, NRC/NRR/DLR/RPB1, to , to Spence W H, PPL Susquehanna, LLC, "Audit Report Regarding the Susquehanna Steam Electric Station , Units 1 and 2 License Renewal Application", (ML082950351)
01/26/2009	Meeting Summary Note to File incl Telcon Record, Verbal Comm, from Gettys E, NRC/NRR/DLR/RPB1, "Summary of Telephone Conference Call Held on 01/05/2009, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC., (Ml090090340)
1/30/2009	Meeting Summary Note to File incl Telcon Record, Verbal Comm, from Gettys E, NRC/NRR/DLR/RPB1, "Summary of Telephone Conference Call Held on 12/18/2008, Between the U.S. Nuclear Regulatory Commission and PPL Susquehanna, LLC., (Ml090080379)
2/10/2009	Letter from Spence W H, PPL Corp PPL NRC/Document Control Desk NRC/NRR, "Susquehanna Steam Electric Station Units 1 and 2 License Renewal Application Amendment to LRA commitment #55", (ML
2/27/09	Region I inspection report (ML090580211)

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	
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S. Ray	Electrical Engineering
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B. Rogers	Scoping and Screening Methodology Audit
A. Sallman	Ventilation System
S. Sheng	Vessels & Internals Integrity
E. Smith	Plant Systems
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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 Susquehanna Steam Electric Station, Units 1 and 2.

Item Number	Reference
1.	10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."
2.	10 CFR Part 54, "Requirements for Renewal of Operating Licenses For Nuclear Power Plants."
3.	10 CFR Part 100, "Reactor Site Criteria."
4.	American Concrete Institute (ACI) 201.1R-68, “Guide for Making a Condition Survey of Concrete in Service.”
5.	ACI 201.2R “Guide to Durable Concrete”
6.	ACI 301-72, "Specifications for Structural Concrete for Buildings."
7.	ACI 318-71, "Building Code Requirements for Reinforced Concrete."
8.	ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures."
9.	American National Standards Institute (ANSI) B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)."
10.	ANSI B30.11, "Monorails and Underhung Cranes."
11.	ANSI B30.16, "Overhead Hoists (Underhung)."
12.	American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section III
13.	ASME Code Section XI
14.	American Society for Metals International, “Metals Handbook,” Ninth Edition.
15.	American Society for Testing and Materials (ASTM) D2276-00, “Standard Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling,”
16.	ASTM C-227, "Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations."
17.	ASTM C-289, "Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)."
18.	ASTM C-295, "Standard Guide for Petrographic Examination of Aggregates for Concrete."
19.	BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," Appendix A, August 23, 1976.
20.	BWRVIP-14, "Evaluation of Crack Growth in BWR Stainless Steel RPV Internals," EPRI Topical Report (TR)-105873
21.	BWRVIP-27, "BWR Vessel and Internals Project, BWR Standby Liquid Control System/Core Plat ∆P Inspection and Flaw Evaluation Guidelines," EPRI TR-107286
22.	BWRVIP-29, “BWR Water Chemistry Guidelines – 1996 Revision,” EPRI TR-103515.
23.	BWRVIP-47, “BWR Lower Plenum Inspection and Flaw Evaluation Guidelines.”
24.	BWRVIP-48, “Vessel ID Attachment Weld and Inspection and Flaw Guidelines,” EPRI TR-108724.
25.	BWRVIP-49, "BWR Vessel and Internals Project, Instrument Penetration Inspection and Flaw Evaluation Guidelines," EPRI TR-108695.
26.	BWRVIP-74, "BWR Reactor Vessel Inspection and Flaw Evaluation Guidelines."
27.	BWRVIP-75, “Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules.”
28.	BWRVIP-76, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines."

29.	BWRVIP-99, “BWR Vessel and Internals Project, Crack Growth Rates in Irradiated Stainless Steels in BWR Internal Components,” EPRI Technical Report 1003018.
30.	BWRVIP-100-A, “BWR Vessel and Internals Project, Updated Assessment of the Fracture Toughness of Irradiated Stainless Steel for BWR Core Shrouds.”
31.	EPRI Report NSAC-202L-R2, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” April 8, 1999.
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