NRC000002

Safety Evaluation Report

With Open Items Related to the License Renewal of Prairie Island Nuclear Generating Plant Units 1 and 2

Docket Nos. 50-282 and 50-306

Northern States Power Company, a Minnesota Corporation (NSPM)

United States Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

June 2009

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, license renewal application (LRA) by the United States (US) Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated April 11, 2008, Nuclear Management Company, LLC, (NMC 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." NMC requests renewal of the Units 1 and 2 operating licenses (Facility Operating License Numbers DPR-42 and DPR-60, respectively) for a period of 20 years beyond the current expirations at midnight August 9, 2013, for Unit 1, and at midnight October 29, 2014, for Unit 2.

PINGP is located within the city limits of the City of Red Wing, Minnesota on the West bank of the Mississippi River in southeastern Minnesota. The NRC issued the construction permits for Units 1 and 2 on June 25, 1968. The NRC issued the operating licenses for Unit 1 on August 9, 1973, and on October 29, 1974, for Unit 2. Units 1 and 2 employ a two-loop pressurized water reactor design with a dry ambient containment. Westinghouse Electric Corporation supplied the nuclear steam supply system and Fluor Pioneer originally designed the balance of the plant, and Northern States Power constructed the plant. The licensed power output of each unit is 1650 megawatt thermal with a gross electrical output of approximately 575 megawatt electric.

This SER presents the status of the staff's review of information submitted through May 8, 2009, the cutoff date for consideration in the SER. The staff identified 3 open items that must be resolved before any final determination on the LRA is reached by the staff on the LRA. SER Section 1.5 summarizes these items. The staff will present its final conclusion on its LRA review in an update to this SER.

Tables

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ABBREVIATIONS

ABS	acrylonitrile-butadiene stryene
ACI	American Concrete Institute
ACSR	Aluminum Cable-Steel Reinforced
AERM	Aging Effect Requiring Management
AF	Auxiliary Feedwater
AFW	Auxiliary Feedwater
AFWP	Auxiliary Feedwater Pump
AMP	Aging Management Program
AMR	Aging Management Review
AMSAC	ATWS Mitigating System Actuation Circuitry
AMSAC/DSS	ATWS Mitigating System Actuation Circuitry/Diverse Scram System
ANSI	American National Standards Institute
APC	Approach Canal
ART	Adjusted Reference Temperature
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing of Materials
ATWS	Anticipated Transients Without Scram
BL	Bleed Steam
BMI	Bottom Mounted Instrumentation
BTP	Branch Technical Position
BWR	Boiling Water Reactor
CAP	Corrective Action Program
CASS	Cast Austenitic Stainless Steel
CC	Component Cooling

CCW	Component Cooling Water
CD	Condensate
CEA	Control Element Assembly
CF	Chemistry Factor
CFR	Code of Federal Regulations
CG	Miscellaneous Gas
CHRMS	Chemistry History and Records Management Software
CL	Cooling Water
CLB	Current Licensing Basis
CMAA	Crane Manufactures Association of America
CRD	Control Rod Drive
CRDM	Control Rod Drive Mechanism
CRGT	Control Rod Guide Tube
CS	Containment Spray
CUF	Cumulative Usage Factor
CvUSE	Charpy Upper-Shelf Energy
CW	Circulating Water
DBA	Design Basis Accident
DBD	Design Basis Document
DBE	Design Basis Event
DE	Water Treatment
DG	Diesel Generators and Support
DGB	Diesel Generator Building
EAF	Environmentally Assisted Fatigue
ECI	Emergency Cooling Water Intake
ECCS	Emergency Core Cooling System
ECT	Eddy Current Testing

EDG	Emergency Diesel Generator
EFPY	Effective Full Power Years
EIC	Electrical and Instrumentation and Control
ENDF	Evaluated Nuclear Data File
EOCI	Electric Overhead Crane Institute
EOL	End of Life
EPDM	Ethylene Propylene Diene Monomer
EPRI	Electric Power Research Institute
ESF	Engineered Safety Features
EQ	Environmental Qualification or Environmentally Qualified
EQML	Environmental Qualification Master List
FAC	Flow-Accelerated Corrosion
f’c	Minimum Strength of Concrete
FCU	Fan Coil Unit
Fen	Environmentally Assisted Fatigue Correction Factor
FERC	Federal Energy Regulatory Commission
FMP	Fatigue Monitoring Program
FO	Fuel Oil
FOH	Fuel Oil Transfer House
FP	Fire Protection
FRN	Federal Register Notice
FSAR	Final Safety Analysis Report
FSWOL	Full Structural Weld Overlay
FW	Feedwater
GALL	Generic Aging Lessons Learned
GEIS	Generic Environmental Impact Statement
GH	Guardhouse Ventilation

GSI	Generic Safety Issue
HAZ	Heat-Affected Zone
HC	Containment Hydrogen Control
HELB	High Energy Line Break
HEPA	High Efficiency Particulate
HGR	Component Supports
HPSI	High Pressure Safety Injection
HS	Heating
HVAC	Heating, Ventilation and Air Conditioning
I&C	Instrumentation & Controls
IASCC	Irradiation-Assisted Stress Corrosion Cracking
ICPA	Insulated Cable Power Association
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IGA	Intergranular Attack
IGSCC	Intergranular Stress Corrosion Cracking
INC	Intake Canal
INPO	Institute of Nuclear Power Operations
IPA	Integrated Plant Assessment
IPCEA	Insulated Power Cable Engineered Association
ISA	The Instrumentation, Systems, and Automation Society
ISG	Interim Staff Guidance
ISI	Inservice Inspection
IWA	General Requirements
IWB	Requirements for Class 1 Components of Light-Water Cooled Power Plants
IWC	Requirements for Class 2 Components of Light-Water Cooled Power Plants
IWD	Requirements for Class 3 Components of Light-Water Cooled Power Plants

IWE	Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooler Power Plants
IWF	Requirements for Class 1, 2, 3, and MC Component Supports of Light-Water Cooled Power Plants
IWL	Requirements for Class CC Concrete Components of Light-Water Cooled Power Plants
LBB	Leak-Before-Break
LBLOCA	Low Break Loss of Coolant Accident
LER	Licensee Event Report
LOCA	Loss-of-Coolant Accident
LTOP	Low-Temperature Overpressure Protection
LRA	License Renewal Application
LWR	Light Water Reactor
MCM	One-thousand Circular Mils
MEB	Metal Enclosed Bus
MIC	Microbiologically-Influenced Corrosion
MRP	Materials Reliability Program
MS	Main Steam
MUR-PU	Measurement Uncertainty Recapture - Power Uprate
MWt	Megawatt Thermal
NaOH	Sodium Hydroxide
NDE	Nondestructive Examination
NEC	National Electric Code
NEI	Nuclear Energy Institute
NESC	Institute of Electrical & Electronic Engineers National Electrical Safety Code
NFPA	National Fire Protection Association
NMC	Nuclear Management Company

NPS	Nominal Pipe Size
NRC	Nuclear Regulatory Commission
NSAC	Nuclear Safety Analysis Center
NSAS	Non-Safety Affecting Safety
NSB	New Service Building
NSP/NSPM	Northern States Power Company
NSSS	Nuclear Steam Supply System
NUMARC	Nuclear Utility Management and Resource Council
NUREG	Nuclear Regulation Document
OCCW	Open Cycle Cooling Water
OE	Operating Experience
OPPS	Overpressure Protection System
OSG	Original Steam Generator
P-T	Pressure Temperature
PINGP	Prairie Island Nuclear Generating Plant
PS	Pressurizer
PTLR	Pressure and Temperature Limit Report
PTS	Pressurized Thermal Shock
PVC	Polyvinyl Chloride
PVDF	Polyvinylidene Fluoride
PWR	Pressurized Water Reactor
PWSCC	Primary Water Stress Corrosion Cracking
QA	Quality Assurance
QAP	Quality Assurance Program

RAI	Request for Additional Information
RC	Reactor Coolant
RCCA	Rod Control Cluster Assembly
RCGVS	Reactor Coolant Gas Vent System
RCP	Reactor Coolant Pump
RCPB	Reactor Coolant Pressure Boundary
RCS	Reactor Coolant System
RCV	Reactor Containment Vessel
RD	Radiation Monitoring
RG	Regulatory Guide
RH	Residual Heat Removal
RHR	Residual Heat Removal
RPV	Reactor Pressure Vessel
RSG	Replacement Steam Generator
RT_{NDT}	Reference Temperature for Nil Ductility Transition
RT_{PTS}	Reference Temperature for Pressurized Thermal Shock
RVCH	Reactor Vessel Closure Head
RVI	Reactor Vessel Internals
RVID	Reactor Vessel Integrity Database
RVLIS	Reactor Vessel Level Instrument System
RVSP	Reactor Vessel Surveillance Program
RWST	Refueling Water Storage Tank
SA	Station and Instrument Air
SB	Stream Generator Blowdown
SBO	Station Blackout
SC	Structure and Component
SCC	Stress Corrosion Cracking
SCH	Screenhouse

SE	Steam Exclusion
SER	Safety Evaluation Report
SF	Spent Fuel Pool Cooling
SFA	Steam/Feedwater Application
SFP	Spent Fuel Pool
SG	Steam Generator
SHB	Shield Building
SI	Safety Injection
SIR	Structural Integrity Report
SM	Plant Sample
SOC	Statement of Consideration
SQUG	Seismic Qualification Utility Group
SRP	Standard Review Plan
SSC	System, Structure, and Component
SSEL	Safe Shutdown Equipment List
TB	Turbine Generator and Support
TLAA	Time-Limited Aging Analysis
TRM	Technical Requirements Manual
TS	Technical Specification
TSC	Technical Support Center
TSTF	Technical Specification Task Force Traveler
UFSAR	Updated Final Safety Analysis Report
USAS	United States of America Standards
USE	Upper-shelf Energy

VT	Visual Examination
WCAP	Westinghouse Commercial Atomic Power
WD	Waste Disposal
WO	Work Order
WOG	Westinghouse Owners Group
ZA	Auxiliary and Radwaste Area Ventilation
ZB	Turbine and Administration Building Ventilation
ZC	Primary Containment Ventilation
ZG	Diesel Generator and Screenhouse Ventilation
ZN	Control Room and Miscellaneous Area Ventilation

SECTION 1

INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) on the license renewal application (LRA) for Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, as filed by Nuclear Management Company, LLC, (NMC or the applicant). By letter dated April 11, 2008, NMC submitted its application to the US Nuclear Regulatory Commission (NRC) for renewal of PINGP operating licenses for an additional 20 years. The NRC staff (the staff) prepared this report to summarize the results of its safety review of the LRA for compliance with Title 10, Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” of the *Code of Federal Regulations* (10 CFR Part 54). The NRC project manager for the license renewal review is Richard Plasse. Mr. Plasse may be contacted by telephone at 301-415-1427 or by electronic mail at richard.plasse@nrc.gov. Alternatively, written correspondence may be sent to the following address:

US Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of License Renewal
Washington, D.C. 20555-0001
Attention: Richard Plasse, Mail Stop O11-F1

By letter dated September 15, 2008, the Commission issued an Order approving transfer of operating authority of Facility Operating License No. DPR-42 and DPR-60, from Nuclear Management Company, LLC, (NMC) to Northern States Power Company, a Minnesota Corporation (NSPM), for PINGP, Units 1 and 2. For the purposes of the SER, the use of the term “applicant” refers to NMC up to September 15, 2008, and to NSPM on and after September 15, 2008.

In its April 11, 2008, submission letter, the applicant requested renewal of the operating licenses issued under Section 104b (Operating License Nos. DPR-42 and DPR-60) 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 August 9, 2013, for Unit 1, and at midnight October 29, 2014, for Unit 2. Prairie Island is located approximately 28 miles southeast of Minneapolis, Minnesota. The NRC issued the construction permits for Units 1 and 2 on June 25, 1968. The NRC issued the operating licenses for Unit 1 on August 9,1973, and on October 29,1974, for Unit 2. Units 1 and 2 employ a pressurized water reactor design with a dry ambient containment. Westinghouse Electric Corporation supplied the nuclear steam supply system and Fluor Pioneer originally designed the balance of the plant, and Northern States Power constructed the plant. The licensed power output of each unit is 1650 megawatt thermal with a gross electrical output of approximately 575 megawatt electric. The updated final safety analysis report (UFSAR) contains details of the plant and the site.

The license renewal process consists of two concurrent reviews, a technical review of safety issues and an environmental review. The NRC regulations in 10 CFR Part 54 and 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," respectively, set forth requirements for these reviews. The safety review for the PINGP 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 May 8, 2009. 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, at the NRC Public Document Room, located on the first floor of One White Flint North, 11555 Rockville Pike, Rockville, MD 20852-2738 (301-415-4737 / 800-397-4209), and the Red Wing Public Library, 225 East Avenue, Red Wing, MN 55066. 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 will prepare 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 is scheduled to issue the draft, plant-specific GEIS Supplement in July 2009. The final, plant-specific GEIS Supplement is scheduled to be issued in January 2010.

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. Because 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 UFSAR supplement with a summary description of the applicant's programs and activities for managing aging effects and an evaluation of time-limited aging analyses (TLAAs) for the period of extended operation.

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

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

In the LRA, the applicant 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 July 30, 2008 at the Red Wing Public Library, 225 East Avenue, Red Wing, Minnesota, to identify plant-specific environmental issues. The draft, plant-specific GEIS Supplement will document the results of the environmental review and make a preliminary recommendation as to the license renewal action. The staff will hold another public meeting in August, 2009 to discuss the draft, plant-specific GEIS Supplement. After considering comments on the draft, the staff will publish the final, plant-specific GEIS Supplement 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:

“NMC requests that conforming changes be made to indemnity agreement No. B-60 for the Prairie Island Nuclear Generating Plant Units 1 and 2, as required, to ensure that the indemnity agreement continues to apply during both the terms of the current licenses and the terms of the renewed licenses. NMC understands that no changes may be necessary for this purpose if the current operating license numbers are retained.”

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 letter dated April 13, 2009, the applicant submitted an LRA update that summarizes 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 (TS) that are necessary to manage aging effects during the period of extended operation. In LRA Appendix D, the applicant stated that that no changes to the TS are necessary for issuance of the renewed PINGP 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.	3.0.3.1.17 and 3.0.3.3.1
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 (BWRs only)

1.5 Summary of Open Items

As a result of its review of the LRA, including additional information submitted through May 8, 2009, the staff identified the following three **open items (OIs)**. An item is considered open if, in the staff's judgment, it does not meet all applicable regulatory requirements at the time of the issuance of this SER. The staff has assigned a unique identifying number to each OI.

OI 2.1.4.1.2-1: (SER Section 2.1.4.1.2 – 10 CFR 54.21(a) Classification of waste gas decay tank)

The staff has reviewed the applicant's response to RAI 2.1-1, Part A, and determined the applicant's position was not adequately justified. The elements of 10 CFR 54.4 (a)(1)(iii) that determine whether an SSC is within the scope of SSCs that must be considered for aging management are:

- The SSC is relied upon to function.
- The SSC functions during or following a design basis event.
- The SSC prevents or mitigates the consequences of the design basis accident.
- The consequences of the design basis accident could result in offsite exposures comparable to those referred to in 10 CFR 50.67(b)(2) or 10 CFR 100.11.

UFSAR Section 14.5.3.1, "Gas Decay Tank Rupture," states that a rupture of a gas decay tank is analyzed to define the limit of the hazard that could result from any malfunction in the gaseous radioactive waste disposal system. The UFSAR also states that the components of the waste gas system are not subjected to high pressures or stresses, they are a Class I design, and they are designed to standards such that a rupture or failure of the system is highly unlikely. The potential offsite exposures are listed in a table at the end of UFSAR Section 14.5.3 that also lists the limits of 10 CFR 100.11.

Thus, the components of the radioactive waste gas system are designed to and relied upon to prevent potential offsite exposures. These components function as a pressure boundary to prevent a rupture that could release the contents of the waste gas decay tanks. The postulated rupture of a waste gas decay tank has been evaluated as a design basis event in the Prairie Island UFSAR.

The offsite dose consequences of the gas decay tank rupture are comparable to those referred to in 10 CFR 100.11 in the sense that the calculated offsite exposures for all design basis accidents are compared to limits derived from those specified in 10 CFR 50.67(b)(2) or 10 CFR 100.11. Although the potential offsite dose consequences may be a small fraction of those referenced in 10 CFR 100.11, the comparison remains necessary to confirm the acceptability of the plant design. This contrasts with the offsite consequences of other routine operational events (e.g., effluent releases) that are compared to limits derived from other regulations.

Thus, the staff determined that the waste gas decay tanks should be included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1)(iii). This is **SER Open Item 2.1.4.1.2-01**.

OI 3.0.3.1.21-1: (SER Section 3.0.3.1.21 – PWR Vessel Internals Program)

The staff received the applicant's amended plant-specific PWR Vessel Internals Program and the associated changes to LRA Commitment No. 25 in a letter dated May 12, 2009. Due to its recent submittal, the staff has not yet had time to review the new, plant-specific program elements for the applicant's AMP against the recommendations and criteria for AMP program elements that are defined in SRP-LR, Appendix A.1, Section A.1.2.3. However, since the acceptability of the PWR Vessel Internals Program is pending the results of the staff's review of the AMP's program elements, the staff's acceptance of the PWR Vessel Internals Program remains open. This is **SER Open Item 3.0.3.1.21-1, Part 1**.

The staff verified that the applicant's UFSAR Supplement includes Commitment No. 25 that was issued on the PWR Vessel Internals Program and that was revised in the applicant's letter of May 12, 2009. Due to its recent submittal, the staff has not yet had time to review the changes that were made to LRA Commitment No. 25. However, since the acceptability of the PWR Vessel Internals Program is pending the staff's review of the revisions to LRA Commitment No. 25, the staff's acceptance of LRA Appendix A2.32 and of LRA Commitment No. 25 remains open. This is **SER Open Item 3.0.3.1.21-1, Part 2**.

OI 3.0.3.2.17-1: (SER Section 3.0.3.2.17 – Structures Monitoring Program)

During the audit, the staff discovered an ongoing issue with water seepage from the refueling cavity into the containment sumps. In RAI B2.1.38-2 dated November 5, 2008, the staff requested the applicant provide information regarding the root cause analysis of the seepage, as well as corrective and preventive actions taken to correct the problem. In the LRA, this seepage issue is tracked under the Structures Monitoring Program, but the staff believes that it also applies to the IWE program due to the possibility of borated water coming into contact with the containment vessel.

By letter dated December 5, 2008, the applicant responded to RAI B2.1.38-2. The applicant stated that the condition was detected by the ASME Section XI, Subsection IWE Program while examining the Class MC pressure retaining vessel. Both the Structures Monitoring Program and the ASME Section XI, Subsection IWE Program took corrective actions to address the leakage. In addition, the applicant provided information during a public meeting on March 2, 2009. The staff reviewed the information provided in both the RAI response and during the public meeting, and discovered that borated water was coming into contact with the containment vessel during refueling outages. Due to the leakage path of borated water along the bottom of the containment vessel, the staff determined that there is a possibility that portions of the containment vessel may remain wetted after refueling outages. By letter dated March 31, 2009, the staff issued follow-up RAI B2.1.38 asking the applicant to discuss its plan for assessing the current condition of the steel containment vessel and to explain how the IWE program, or a plant-specific program, will manage aging of the vessel, especially in inaccessible regions, during the period of extended operation. By letter dated April 6, 2009, the applicant responded to follow-up RAI B2.1.38. The staff is currently reviewing the response, and this is **SER Open Item 3.0.3.2.17-1**.

1.6 Summary of Confirmatory Items

As a result of its review of the LRA, including additional information submitted through May 08, 2009, the staff determines that no confirmatory items exist which would require a formal response from the applicant.

1.7 Summary of Proposed License Conditions

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

The first license condition requires the applicant to include the UFSAR supplement required by 10 CFR 54.21(d) in the first UFSAR 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, “Contents of Application—Technical Information,” of the *Code of Federal Regulations* (10 CFR 54.21) requires for each license renewal application (LRA) an integrated plant assessment (IPA) listing those structures and components (SCs) subject to an aging management review (AMR) for all of the structures, systems, and components (SSCs) within the scope of license renewal.

LRA Section 2.1, “Scoping and Screening Methodology,” describes the methodology for identifying SSCs at the Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, within the scope of license renewal and SCs subject to an AMR. The staff reviewed the scoping and screening methodology of Northern States Power Company, a Minnesota Corporation (NSPM or the applicant) to determine whether it meets the scoping requirements of 10 CFR 54.4(a) and the screening requirements of 10 CFR 54.21.

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

2.1.2 Summary of Technical Information in the Application

In LRA Sections 2 and 3, the applicant provides technical information pursuant to 10 CFR 54.4, “Scope,” and 10 CFR 54.21(a). This safety evaluation report (SER) with open items, contains sections entitled “Summary of Technical Information in the Application,” which provide information taken directly from the LRA.

In LRA Section 2.1, the applicant describes the process it used to identify the SSCs that meet the license renewal scoping criteria under 10 CFR 54.4(a), and the process used to identify the SCs that are subject to an AMR, as required by 10 CFR 54.21(a)(1). The applicant provided the results of the process used for identifying the SCs subject to an AMR in the following LRA Sections:

(a) LRA Section 2.2, “Plant Level Scoping Results”

(b) LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”

(c) LRA Section 2.4, “Scoping and Screening Results: Containments, Structures, and Component Supports”

(d) LRA Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Controls Systems”

In LRA Section 3.0, Aging Management Review Methodology, the applicant describes its aging management results as follows:

(a) LRA Section 3.1, “Aging Management of Reactor Vessel, Internals, and Reactor Coolant System”

(b) LRA Section 3.2, “Aging Management of Engineered Safety Features”

(c) LRA Section 3.3, “Aging Management of Auxiliary Systems”

(d) LRA Section 3.4, “Aging Management of Steam and Power Conversion System”

(e) LRA Section 3.5, “Aging Management of Containment, Structures and Component Supports”

(f) LRA Section 3.6, “Aging Management of Electrical and Instrumentation and Controls”

(g) LRA Section 4.0, “Time-Limited Aging Analyses (TLAA), contains the applicant’s identification and evaluation of TLAAs”

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, Revision 1, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, (SRP-LR), Section 2.1, “Scoping and Screening Methodology. The following regulations form the basis for the acceptance criteria for the scoping and screening methodology review:

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

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

- Section 2.1, to ensure that the applicant described a process for identifying SSCs that are within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)

- Section 2.2, to ensure that the applicant described a process for determining the SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1) and (a)(2)

In addition, the staff conducted a scoping and screening methodology audit at PINGP Units 1 and 2, located near Welch, Minnesota, during the week of August 4-7, 2008. 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. The staff conducted detailed discussions with the applicant on the implementation and control of the license renewal program and reviewed the administrative control documentation used by the applicant during the scoping and screening process, the quality practices used by the applicant to develop the LRA, and the training and qualification of the LRA development team.

The staff evaluated the quality attributes of the applicant's aging management program (AMP) activities described in Appendix A, "Updated Final Safety Analysis Report (UFSAR) Supplement," and Appendix B, "Aging Management Programs," of the LRA. On a sampling basis, the staff performed a system review of the main steam system, residual heat removal system, turbine building, and the screenhouse, including a review of the scoping and screening results reports and supporting design documentation used to develop the reports. The purpose of the staff's review was to ensure that the applicant had appropriately implemented the methodology outlined in the administrative controls and to verify that the results are consistent with the current licensing basis (CLB) documentation.

2.1.3.1 Implementing Procedures and Documentation Sources Used for Scoping and Screening

The staff reviewed the applicant's scoping and screening implementing procedures as documented in the Scoping and Screening Methodology Audit trip report, dated October 24, 2008, to verify that the process used to identify SCs subject to an AMR was consistent with the SRP-LR. Additionally, the staff reviewed the scope of CLB documentation sources and the process used by the applicant to ensure that applicant's commitments, as documented in the CLB and relative to the requirements of 10 CFR 54.4 and 10 CFR 54.21, 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, the applicant addressed the following information sources for the license renewal scoping and screening process:

- updated safety analysis report (UFSAR)
- technical specifications
- design basis documents (DBDs)
- plant equipment database

- Q-List
- Q-List extension
- controlled drawing file
- industry codes, standards, and regulations
- NRC docketed correspondence and documents
- technical correspondence, analyses, and reports
- calculations
- modifications and alterations
- nuclear steam supply system supplier, architect-engineer, vendor reports, specifications, and drawings
- plant drawings

LRA Section 2.1.2.3, "SSC Functions," states that information sources, including the UFSAR, docketed correspondence with the NRC, Maintenance Rule documents, and DBDs provided information on system-level and structure-level functions. Documentation of references used in this process was included for each function. According to the LRA, a list of functions was developed for systems, structures, and commodity groups at PINGP, which were evaluated against the criteria specified in 10 CFR 54.4 (a)(1), (2), or (3). LRA Section 2.1.2.3 further states that once system-level and structure-level functions were identified, the plant equipment database and other information sources were used to identify component functions and determine if these functions were in-scope for license renewal.

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, and reports, as documented in the audit report, to ensure the guidance is consistent with the requirements of the Rule, the SRP-LR, and NEI 95-10. The staff finds the overall process used to implement the 10 CFR Part 54 requirements described in the implementing procedures and AMRs is consistent with the Rule, the SRP-LR, and industry guidance.

The applicant's implementing procedures contain guidance for determining plant SSCs within the scope of the Rule, and for determining which SCs within the scope of license renewal are subject to an AMR. During the review of the implementing procedures, the staff focused on the consistency of the detailed procedural guidance with information in the LRA (including the implementation of NRC staff positions documented in the SRP-LR), and the information in the applicant's responses, dated December 5, 2008, to the staff's requests for additional information (RAIs).

After reviewing the LRA and supporting documentation, the staff determined that the scoping and screening methodology instructions are consistent with the methodology description provided in LRA Section 2.1. The applicant's methodology is sufficiently detailed 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 is sufficiently comprehensive to identify SSCs within the scope of license renewal, as well as SCs requiring an AMR. Pursuant to 10 CFR 54.3(a), the CLB is the set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design bases that are docketed and in effect. The CLB includes applicable NRC regulations, orders, license conditions, exemptions, technical specifications, and design-basis information (documented in the most recent UFSAR). The CLB also includes licensee commitments remaining in effect that were made in docketed licensing correspondence, (such as licensee responses to NRC bulletins, generic letters, and enforcement actions), and licensee commitments documented in NRC safety evaluations or licensee event reports.

During the audit, the staff reviewed pertinent information sources used by the applicant including the UFSAR, design basis documents, and license renewal boundary drawings. In addition, the applicant's license renewal process identified additional sources of plant information pertinent to the scoping and screening process, including, the UFSAR, DBDs, the plant equipment database, the Q-List and Q-List extension, NRC-docketed correspondence and documents, and plant drawings. The staff confirmed that the applicant's detailed license renewal program guidelines specified the use of the CLB source information in developing scoping evaluations.

The plant equipment database, Q-List and Q-List extension, UFSAR, and DBDs were the applicant's primary repository for system identification and component safety classification information. During the audit, the staff reviewed the applicant's administrative controls for the plant equipment database, the Q-List and Q-List extension, DBDs, and other information sources used to verify system information. These controls are described and implementation is governed by plant administrative procedures. Based on a review of the administrative controls and a sample of the system classification information contained in the applicable PINGP documentation, the NRC staff concludes that the applicant has established adequate measures to control the integrity and reliability of PINGP system identification and safety classification data. Therefore, the staff concludes that the information sources used by PINGP during the scoping and screening process provided a sufficiently controlled source of system and component data to support scoping and screening evaluations.

During the staff's review of the applicant's CLB evaluation process, the applicant 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 the implementing procedures and results reports used to support identification of the SSCs that the applicant relied on to demonstrate compliance with the safety-related criteria, nonsafety-related criteria and the regulated events criteria pursuant to 10 CFR 54.4(a). The applicant's license renewal program guidelines provided a listing of documents used to support scoping and screening evaluations. The staff finds these design documentation sources to be useful for ensuring that the initial scope of SSCs identified by the applicant was consistent with the plant's CLB.

2.1.3.1.3 Conclusion

Based on its review of LRA Section 2.1, the 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 considers CLB information in a manner consistent with the Rule, the SRP-LR and NEI 95-10 guidance and, therefore, is acceptable.

2.1.3.2 Quality Controls Applied to LRA Development

2.1.3.2.1 Staff Evaluation

The staff reviewed the quality assurance controls used by the applicant to ensure that scoping and screening methodologies used to develop the LRA were adequately implemented. The applicant applied the following quality assurance processes during the LRA development:

- The scoping and screening methodology was governed by written procedures and guidelines.
- The LRA was examined by the applicant’s team in a structured self-assessment.
- The LRA was examined by internal assessment teams, including a plant operation review committee, peer review validation, legal review, and regulatory affairs review. Additionally, a site VP review, validation, certification process, and source document change control were implemented. Each of these teams included different levels of plant and organizational management.
- Pre-activity briefings were conducted prior to new major evolutions.
- The LRA was examined by external assessment teams, including peer reviews done by teams of personnel from other license renewal applicants.
- The staff reviewed the applicant’s written procedures and documentation of assessment activities and determined that the applicant had developed adequate procedures to control the LRA development and assess the results of the activities.

2.1.3.2.2 Conclusion

On the basis of its review of pertinent LRA development guidance, discussion with the applicant’s license renewal staff, and a review of the applicant’s documentation of the activities performed to assess the quality of the LRA, the staff concludes that the applicant’s quality assurance activities meet current regulatory requirements and provide assurance that LRA development activities were performed in accordance 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. As outlined in the implementing procedures, the applicant requires training for all personnel participating in the development of the LRA and uses only trained and qualified personnel to prepare the scoping and screening implementing procedures. The training included the following activities:

- Engineering supervisors had prior experience supplemented with classroom training and mentoring from an NEI task force, working groups, and peers.
- Contractor staff had previous license renewal experience from other sites.
- Each license renewal staff member completed training in general license renewal requirements and project procedures, and training in discipline-specific areas.
- Initial qualification was completed before the project started and included the review of the license renewal process, license renewal project guidelines, and relevant industry documents such as 10 CFR Part 54 regulations, NEI 95-10, Regulatory Guide 1.188, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses,” SRP-LR, and NUREG-1801, “Generic Aging Lessons Learned Report,” Revision 1 (GALL Report).

The staff reviewed the applicant’s written procedures and documentation of training activities and determined that the applicant had developed and implemented adequate procedures to monitor the training of personnel performing LRA activities.

2.1.3.3.2 Conclusion

On the basis of discussions with the applicant’s license renewal project personnel responsible for the scoping and screening process and review of selected documentation in support of the process, the staff concludes that the applicant’s personnel are adequately trained to implement the scoping and screening methodology described in the applicant’s implementing procedures and the LRA.

2.1.3.4 Scoping and Screening Program Review Conclusion

Based on the review of information provided 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 methodology audit, the staff concludes that the applicant’s scoping and screening program is consistent with the SRP-LR and the requirements of 10 CFR Part 54, and, therefore, is acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

LRA Section 2.1.2.1 states that the scoping process categorized the entire plant in terms of SSCs and commodity groups with respect to license renewal. According to the LRA, SSC and commodity group functions were identified and evaluated against criteria provided in 10 CFR Part 54.4 (a)(1), (2), and (3) to determine whether the item should be considered within the scope of license renewal. The applicant asserts that the scoping process identified SSCs that are safety-related and perform or support an intended function for responding to a design-basis event (DBE); are nonsafety-related, but their failure could prevent accomplishment of a safety-related function; or support a specific requirement for one of the five regulated events applicable to license renewal.

LRA Section 2.1.2.1 further states that even if only a portion of an SSC or commodity fulfilled a scoping criterion, the item was identified as in-scope for license renewal and received further evaluation. According to the LRA, those SSCs or commodities identified as not meeting any scoping criterion were not addressed further. LRA Section 2.1.2.1 asserted that the scoping methodology utilized by PINGP is consistent with the guidance provided by the NRC in the SRP-LR, by the industry in NEI 95-10, and by NRC Interim Staff Guidance.

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

2.1.4.1.1 Summary of Technical Information in the Application

LRA Section 2.1.2.4.1, “Scoping Criteria 1-Safety-Related SSCs,” states:

The PINGP definition of safety-related SSCs within the CLB is not completely consistent with the scoping criteria under 10 CFR 54.4(a)(1), and therefore the scoping methodology used at PINGP followed the criteria under 10 CFR 54.4(a)(1) and not the PINGP definition. The significant difference between the PINGP CLB definition of safety-related and the Rule is the CLB applicability to design basis accidents versus the broader Rule applicability to DBEs. The other difference is in the applicability of exposure guidelines; in addition to the guidelines of 10 CFR 100, 10 CFR 54.4(a)(1)(iii) references the dose guidelines of 10 CFR 50.34(a)(1) and 10 CFR 50.67(b)(2). For plants (including PINGP) with construction permits issued before January 10, 1997, 10 CFR 50.34(a)(1) refers to the guidelines of 10 CFR 100, which are included in the PINGP definition of safety-related. The exposure guidelines of 10 CFR 50.67(b)(2) address the alternate source term, which PINGP has credited only for the refueling accident analysis. A review was performed of the systems and components that were credited in this limited use of 10 CFR 50.67 to ensure the applicable SSCs were included in the scope of license renewal. As described in LRA Section 2.1.2.3, SSC and commodity group functions were identified using a number of information sources. These functions were compared to scoping Criterion 1 to identify those that should be considered in-scope for license renewal for PINGP DBEs, regardless of their current classification in the plant equipment database or supporting Q-List information sources. To confirm the function scoping, results were compared to the current component quality classifications and differences were evaluated.

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 DBE to ensure the following functions: (1) the integrity of the reactor coolant pressure boundary; (2) the ability to shut down the reactor and maintain it in a safe shutdown condition; or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11.

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

> The set of design basis events as defined in the rule is not limited to Chapter 15 (or equivalent) of the UFSAR. Examples of design basis events 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 design basis events as defined in 10 CFR 50.49(b)(1) may be found in any chapter of the facility UFSAR, the Commission's regulations, NRC orders, exemptions, or license conditions within the CLB. These sources should also be reviewed to identify SSCs relied upon to remain functional during and following DBEs (as defined in 10 CFR 50.49(b)(1)) to ensure the functions described in 10 CFR 54.4(a)(1).

During the audit the applicant stated that it evaluated the types of events listed in NEI 95-10 (i.e., anticipated operational occurrences, design basis accidents (DBAs), external events and natural phenomena) that were applicable to PINGP. The staff reviewed the applicant’s basis documents, which described all design-basis conditions in the PINGP CLB and addressed all events defined by 10 CFR 50.49(b)(1) and 10 CFR 54.4(a)(1). The PINGP UFSAR and basis documents discussed events such as internal and external flooding, tornados, and missiles. The staff concludes that the applicant’s evaluation of DBEs was consistent with SRP-LR.

The applicant performed scoping of SSCs for the 10 CFR 54.4(a)(1) criterion in accordance with the license renewal implementing procedures, which provide guidance for the preparation, review, verification, and approval of the scoping evaluations to ensure the adequacy of the results of the scoping process. The staff reviewed the implementing procedures governing the applicant’s evaluation of safety-related SSCs, and sampled the applicant’s reports of the scoping results to ensure that the applicant applied the methodology in accordance with implementing procedures. In addition, the staff discussed the methodology and results with the applicant's personnel who were responsible for these evaluations.

The staff reviewed the applicant’s evaluation of the Rule and CLB definitions pertaining to 10 CFR 54.4(a)(1) and determined that the PINGP CLB definition of safety-related referred to 10 CFR 50.67 (in specific circumstances) and 10 CFR 100. LRA Section 2.1.2 documents the applicant’s definition of safety-related as it relates to the definition in the Rule. Based on its review, the staff confirmed that the applicant correctly identified the applicable accident dose criteria for PINGP, Units 1 and 2, as set forth in 10 CFR 54.4(a)(1)(iii). The applicable CLB dose consequence DBA criteria is set forth in 10 CFR 100.11 for PINGP Units 1 and 2, with the exception that the requirements of 10 CFR 50.67(b)(2), which concern the use of an alternate source term in the dose analysis, are applicable to PINGP, Units 1 and 2, in specific circumstances described in the refueling accident analysis. The staff confirmed that the applicant had performed a review of the systems and components that were credited in this limited use of 10 CFR 50.67 and verified that the applicable SSCs were included within the scope of license renewal.

The staff reviewed a sample of the license renewal scoping results for the main steam system, residual heat removal system, the turbine building, and the screen house to provide additional assurance that the applicant adequately implemented their scoping methodology with respect to 10 CFR 54.4(a)(1). The staff verified that the applicant developed the scoping results for each of the sampled systems consistent with the methodology, identified the SSCs credited for performing intended functions, and adequately described the basis for the results, as well as the intended functions. The staff also confirmed that the applicant had identified and used pertinent engineering and licensing information to identify the SSCs required to be within the scope of license renewal in accordance with the 10 CFR 54.4(a)(1) criteria.

The staff determined that additional information would be required to complete the review of the applicant's scoping methodology. Request for Additional Information (RAI) 2.1-1, dated November 5, 2008, states that during the NRC scoping and screening methodology audit, performed August 4-7, 2008, the applicant indicated that there were plant-defined safety-related components that were not included within the scope for license renewal in accordance with 10 CFR 54.4(a)(1), as follows:

(a) During the audit, the applicant stated that although the waste gas decay tanks were defined as safety-related per the plant's definition, they were not in-scope for license renewal because they did not meet the above criteria (i), (ii), or (iii). Specifically, for criteria (iii), the applicant stated that the plant's criteria for safety-related SSCs was more conservative than the license renewal criteria because the PINGP has committed to the more conservative 1% of the 10 CFR 100.11 exposure guidelines following a design-basis accident. The applicant also documented that the term "comparable" in criteria (iii) has been defined by the nuclear industry as greater than or equal to 10% and the value is consistent with NRC guidance in Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants."

    The staff requested that the applicant provide: (1) specific documentation, references, and citations that define the term "comparable," as used in 10 CFR 54.4(a)(1)(iii), to be greater than or equal to 10% and (2) a description of the methods used and the basis for conclusions, in determining that the safety-related waste gas decay tanks would not be included within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(1).

(b) During the audit, the applicant stated that the boric acid storage tanks were defined as safety-related per the plant's definition, but were not within the scope of license renewal for 10 CFR 54.4(a)(1). The staff requested the applicant provide a description of the methods used and the basis for conclusions, in determining that the safety-related boric acid storage tanks would not be included within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(1).

The applicant responded to RAI 2.1-1 by letter dated December 5, 2008, which states:

(a) The term "comparable" in 10 CFR 54.4(a)(1)(iii) is not defined within the license renewal Rule, Statements of Consideration or industry license renewal guidance documents. While this language is not specific, it is reasonable and logical to interpret the words "... exposures comparable to those referred to in 10 CFR 50.34(a)(1), 50.67(b)(2), or 100.11" as meaning "... exposures which approach the dose reference values (limits) defined in 10 CFR 50.34(a)(1), 50.67(b)(2), or 100.11."

    The Standard Review Plan for Review of Safety Analysis Reports for Nuclear Power Plants (NUREG-0800), Section 15.0.3, states that the radiological consequences of design-basis accidents and transients should "not exceed," be "well within," or be a "small fraction" of the exposure guidelines of 10 CFR 100.11 (also see NUREG-0800 Sections 15.3.3-15.3.4, 15.6.3 and BTP 11-5). This NRC guidance defines "not exceed" to mean less than or equal to 100% of 10 CFR 100.11 guideline exposures, “well within” to mean less than 25% of 10 CFR 100.11 guideline exposures, and the term “small fraction of” to mean less than 10% of 10 CFR 100.11 guideline exposures.

ANS-58.14, Safety and Pressure Integrity Classification Criteria for Light Water Reactors, Section 5.3.1.4, defines “comparable” as greater than or equal to 10% of 10 CFR 100.11 guideline exposures. This value is chosen because: (1) it is consistent with NUREG-0800 (i.e. “not exceed” and “well within” are “comparable”; however, “small fraction” is not “comparable”); (2) philosophically, being within an order of magnitude is comparable while more than an order of magnitude is not; and (3) it yields results consistent with past and current industry and NRC practice. The standard goes on to state, "This amplification of the safety-related definition recognizes that there must be a threshold value for off-site exposures that defines the boundary between safety-related and nonsafety-related."

The waste gas decay tanks are designated as safety-related based on PINGP-unique criteria of 1% of 10 CFR 100 limits contained in the PINGP UFSAR and plant procedures. NEI 95-10 acknowledges that some components may be designated as safety-related, but not meet the definition of the Rule. Section 3.1.1 of NEI 95-10 states:

"It is conceivable that, because of plant unique considerations and preferences, applicants may have previously elected to designate some systems, structures and components as safety-related that do not perform any of the requirements of 54.4(a)(1). Therefore, a system, structure or component may not meet the requirements of 54.4(a)(1) although it is designated as safety-related for plant- specific reasons."

As shown in UFSAR 14.5.3.2, a rupture of a waste gas decay tank does not result in offsite exposures comparable (i.e. greater than or equal to 10%) to those referred to in 10 CFR 100 and therefore the tanks are not within the scope of license renewal for 10 CFR 54.4(a)(1).

(b) The boric acid storage tanks are designated as safety-related based on plant preference. NEI 95-10 acknowledges that some components may be designated as safety-related, but not meet the definition of the Rule. Section 3.1.1 of NEI 95-10 states:

It is conceivable that, because of plant unique considerations and preferences, applicants may have previously elected to designate some systems, structures and components as safety-related that do not perform any of the requirements of 54.4(a)(1). Therefore, a system, structure or component may not meet the requirements of 54.4(a)(1) although it is designated as safety-related for plants specific reasons.

License Amendments 156/147, dated April 16, 2001, removed the boric acid storage tanks (BASTs) from the Technical Specifications for the Safety Injection System because the high concentration boric acid in the BASTs is unnecessary for accident mitigation. Therefore, the BASTs are not required to accomplish the functions described in 54(a)(1) and are not within the scope of license renewal for 10 CFR 54.4(a)(1). The tanks are included within the scope of license renewal for 10 CFR 54.4(a)(2).

The staff has reviewed the applicant's response to RAI 2.1-1, Part A, and determined the applicant's position was not adequately justified. The elements of 10 CFR 54.4 (a)(1)(iii) that determine whether an SSC is within the scope of SSCs that must be considered for aging management are:

- The SSC is relied upon to function.
- The SSC functions during or following a design basis event.
- The SSC prevents or mitigates the consequences of the design basis accident..
- The consequences of the design basis accident could result in offsite exposures comparable to those referred to in 10 CFR 50.67(b)(2) or 10 CFR 100.11.

UFSAR Section 14.5.3.1, "Gas Decay Tank Rupture," states that a rupture of a gas decay tank is analyzed to define the limit of the hazard that could result from any malfunction in the gaseous radioactive waste disposal system. The UFSAR also states that the components of the waste gas system are not subjected to high pressures or stresses, they are a Class I design, and they are designed to standards such that a rupture or failure of the system is highly unlikely. The potential offsite exposures are listed in a table at the end of UFSAR Section 14.5.3 that also lists the limits of 10 CFR 100.11.

Thus, the components of the radioactive waste gas system are designed to and relied upon to prevent potential offsite exposures. These components function as a pressure boundary to prevent a rupture that could release the contents of the waste gas decay tanks. The postulated rupture of a waste gas decay tank has been evaluated as a design basis event in the Prairie Island UFSAR.

The offsite dose consequences of the gas decay tank rupture are comparable to those referred to in 10 CFR 100.11 in the sense that the calculated offsite exposures for all design basis accidents are compared to limits derived from those specified in 10 CFR 50.67(b)(2) or 10 CFR 100.11. Although the potential offsite dose consequences may be a small fraction of those referenced in 10 CFR 100.11, the comparison remains necessary to confirm the acceptability of the plant design. This contrasts with the offsite consequences of other routine operational events (e.g., effluent releases) that are compared to limits derived from other regulations.

Thus, the staff determined that the waste gas decay tanks should be included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1)(iii). **This is SER Open Item 2.1.4.1.2-01**.

The staff reviewed the applicant's response to RAI 2.1-1, Part B, and determined that the applicant had demonstrated that the safety-related boric acid storage tanks did not have an intended function meeting the criteria of 10 CFR 54.4 (a)(1) and have, therefore, included the boric acid storage tanks within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff concludes that this resolves RAI 2.1-1 Part B.

2.1.4.1.3 Conclusion

On the basis of its review of systems, discussions with the applicant, and review of the applicant's scoping process, the staff concludes that, except for **SER Open Item 2.1.4.1.2-01,** the applicant's methodology for identifying systems and structures is consistent with the SRP-LR and 10 CFR 54.4(a)(1), and therefore, is acceptable. The open item will be addressed in a subsequent SER.

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

2.1.4.2.1 Summary of Technical Information in the Application

LRA Section 2.1.2.4.2, “Scoping Criterion 2 - Non-Safety Related Affecting Safety-Related,” states:

> SSCs meeting Scoping Criterion 2 for PINGP are included in one of the following three categories:
>
> - The plant's Current Licensing Basis (CLB). The PINGP CLB was used to identify nonsafety-related SSCs that have the potential to prevent satisfactory accomplishment of safety related SSC intended functions, and therefore are within the scope of license renewal for 10 CFR 54.4(a)(2).
>
> - Non-safety related SSCs directly connected to safety related SSCs (typically piping systems) up to and including the first seismic or equivalent anchor past the safety/non-safety interface are within the scope of license renewal for 10 CFR 54.4(a)(2).
>
> - Non-safety related SSCs that are not directly connected to safety related SSCs, or are connected downstream of the first seismic or equivalent anchor past the safety/non-safety interface, but have a potential spatial interaction such that their failure could adversely impact the performance of a safety related SSC intended function, are within the scope of license renewal for 10 CFR 54.4(a)(2).
>
> SSCs meeting scoping Criterion 2 in the first two categories were identified during document reviews including the UFSAR, plant drawings, design documents, piping analyses, plant equipment database, and other CLB documents. SSCs in the third category were identified by both document reviews and plant walkdowns to identify possible spatial interactions meeting the broader criteria established for license renewal.

LRA Section 2.1.2.4.2 states in relation to nonsafety-related SSCs directly connected to safety-related SSCs:

> For nonsafety-related SSCs directly connected to safety related SSCs (typically piping and duct systems), the non-safety piping and supports, up to and including the first seismic or equivalent anchor beyond the safety/non-safety interface, are within the scope of license renewal per 10 CFR 54.4(a)(2). As an alternative to specifically identifying a seismic anchor or series of equivalent anchors, a bounding approach was typically used, which includes enough of the non-safety

piping run to ensure these anchors are included and thereby ensure the piping and anchor intended functions are maintained. The application of this approach is discussed in detail in project documents.

For piping and ducting systems in specific cases where use of the bounding approach was not desirable, then the non-safety piping and supports beyond the safety related/non-safety interface were considered to be in scope for 10 CFR 54.4(a)(2) up to and including the first seismic or equivalent anchor (i.e., device, equipment or structure that ensures that forces and moments are restrained in three orthogonal directions). Where a seismic or equivalent anchor was not clearly described, a combination of restraints and supports were used such that the non-safety piping and associated structures and components attached to safety related piping are included in scope up to a boundary point that encompasses at least two (2) supports in each of three (3) orthogonal directions. Non-safety related SSCs considered to be in scope for 10 CFR 54.4(a)(2) using the criteria described above were marked “in license renewal Boundary” in the license renewal database and highlighted “In Scope” on the license renewal Boundary Drawings.

LRA Section 2.1.2.4.2 states in relation to nonsafety-related SSCs not directly connected to safety-related SSCs:

For nonsafety-related SSCs that are not directly connected to safety related SSCs, or are connected downstream of the first seismic or equivalent anchor past the safety/non-safety interface, the nonsafety-related SSCs may be in scope if their failure could prevent the performance of the system safety function for which the safety related SSC is required. To determine which nonsafety-related SSCs may be in scope for 10 CFR 54.4(a)(2), either of the following two options were used.

<u>Mitigative Option</u>. The mitigative option was utilized to exclude areas from nonsafety-related affecting safety-related NSAS scoping. Areas were excluded provided they did not contain any 10 CFR 54.4(a)(1) components and there are mitigative features that would prevent spatial interaction (such as spray, leakage or flooding) outside of the excluded area. Where the mitigative option is used to exclude areas from NSAS scoping, the mitigative features are within the scope of license renewal per 10 CFR 54.4(a)(2) and non-safety systems within these areas can be excluded from the scope of license renewal. These mitigative features are typically associated with the structures and are further evaluated in the Civil/Structural AMRs. However, nonsafety-related SSCs directly connected to safety related SSCs remain in scope for license renewal in accordance with Section 2.1.2.4.2.2 even if these are partly or wholly located within exclusion areas. In addition, mitigative features currently credited in the CLB are included in the scope of license renewal for 10 CFR 54.4(a)(2) for providing a mitigative function. Guard pipes, jet impingement shields and pipe whip restraints are evaluated with the structures where they reside and are assumed to be within the scope of license renewal for 10 CFR 54.4(a)(2).

Preventive Option. The preventive option utilized in the PINGP license renewal process identifies nonsafety-related SSCs that have a spatial interaction (pipe whip, physical impacts due to high energy system piping falling due to flow accelerated corrosion failures, jet impingement and spray, drip or flooding from the nonsafety-related system) that could create additional failures of the safety related SSCs.

Non-Safety Related SSCs Containing Liquid and Steam. SSCs containing liquids or steam, including high energy, moderate and low energy systems, and located in structures housing 10 CFR 54.4(a)(1) SSCs are assumed to have a spatial interaction unless excluded by the mitigative option. Therefore, these SSCs, along with associated component supports, are included within the scope of license renewal for 10 CFR 54.4(a)(2).

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 the satisfactory accomplishment of safety-related functions, for SSCs relied on to remain functional during and following a DBE to ensure (1) the integrity of the reactor coolant pressure boundary; (2) the ability to shut down the reactor and maintain it in a safe shutdown condition; or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11.

Regulatory Guide 1.188, Revision 1, endorses the use of NEI 95-10, Revision 6. NEI 95-10 discusses the staff's position on 10 CFR 54.4(a)(2) scoping criteria, including nonsafety-related SSCs typically identified in the CLB; consideration of missiles, cranes, flooding, and high energy line breaks (HELBs); nonsafety-related SSCs connected to safety-related SSCs; nonsafety-related SSCs in proximity to safety-related SSCs; and mitigative and preventative options related to nonsafety-related and safety-related SSCs interactions.

In addition, the staff's position (as discussed in NEI 95-10, Revision 6) is that applicants should not consider hypothetical failures, but rather should base their evaluation on the plant's CLB, engineering judgment and analyses, and relevant operating experience. NEI 95-10 further describes operating experience as all documented plant-specific and industry-wide experience that can be used to determine the plausibility of a failure. Documentation would include NRC generic communications and event reports, plant-specific condition reports, industry reports such as safety operational event reports, and engineering evaluations. The staff reviewed LRA Section 2.1.2.4.2 in which the applicant described the scoping methodology for nonsafety-related SSCs pursuant to 10 CFR 54.4(a)(2). In addition, the staff reviewed the applicant's implementing document and results report, which documented the guidance and corresponding results of the applicant's scoping review pursuant to 10 CFR 54.4(a)(2). The applicant stated that it performed the review in accordance with the guidance contained in NEI 95-10, Revision 6, Appendix F.

Nonsafety-Related SSCs Required to Perform a Function that Supports a Safety-Related SSC. The staff determined that nonsafety-related SSCs required to remain functional to support a safety-related function had been reviewed by the applicant for inclusion within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff reviewed the evaluating criteria discussed in LRA Section 2.1.2.4.2 and the applicant's 10 CFR 54.4(a)(2) implementing document. The staff confirmed that the applicant had reviewed the UFSAR, plant drawings, plant equipment database, Q-List, Q-List extension, and other CLB documents to identify the nonsafety-related systems and structures that function to support a safety-related system whose failure could prevent the performance of a safety-related intended function. The applicant also considered missiles, overhead handling systems, internal and external flooding, and HELBs. Accordingly, the staff finds that the applicant implemented an acceptable method for including nonsafety-related systems that perform functions that support safety-related intended functions, within the scope of license renewal as required by 10 CFR 54.4(a)(2).

Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs. The staff confirmed that nonsafety-related SSCs, directly connected to SSCs, had been reviewed by the applicant for inclusion within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff reviewed the evaluating criteria discussed in LRA Section 2.1.2.4.2 and the applicant's 10 CFR 54.4(a)(2) implementing document. The applicant had reviewed the safety-related to nonsafety-related interfaces for each mechanical system in order to identify the nonsafety-related components located between the safety to nonsafety-related interface and license renewal structural boundary.

The staff determined that in order to identify the nonsafety-related SSCs connected to safety-related SSCs and required to be structurally sound to maintain the integrity of the safety-related SSCs, the applicant used a combination of the following to identify the portion of nonsafety-related piping systems to include within the scope of license renewal:

- Seismic anchors
- Equivalent anchors
- Bounding conditions described in NEI 95-10, Appendix F (base-mounted component, flexible connection, or inclusion of the entire piping run)

Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs. The staff confirmed that nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs had been reviewed by the applicant for inclusion within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff reviewed the evaluating criteria discussed in the LRA Section 2.1.2.4.2 and the applicant's 10 CFR 54.4(a)(2) implementing procedure. The applicant had considered physical impacts (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 staff further confirmed that the applicant used a spaces approach to identify the portions of nonsafety-related systems with the potential for spatial interaction with safety-related SSCs. The spaces approach focused on the interaction between nonsafety-related and safety-related SSCs that are located in the same space, which was defined for the purposes of the review, as a structure containing active or passive safety-related SSCs.

LRA Section 2.1.2.4.2 and the applicant's implementing document states that the applicant had used a mitigative approach when considering the impact of nonsafety-related SSCs on safety-related SSCs for occurrences discussed in the CLB. The staff reviewed the applicant's CLB information, primarily contained in the UFSAR, related to missiles, crane load drops, flooding and high-energy line breaks. The staff determined that the applicant had included the features designed to protect safety-related SSCs from the effects of these occurrences through the use of mitigating features such as walls, curbs, dikes, doors, whip restraints, protective covers, guard pipes, and jet impingement shields. The applicant had also used a mitigative approach to exclude spaces that did not contain safety-related SSCs by including the mitigative features such as walls, floors, doors and dikes, which would mitigate the interaction of spray, leakage or flooding on safety-related SSCs located outside of the excluded space. The staff confirmed that the applicant had included the mitigating features within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

LRA Section 2.1.2.4.2 and the applicant's implementing document states that the applicant had used a preventive approach, which considered the impact of nonsafety-related SSCs contained in the same space as safety-related SSCs. The staff determined that the applicant had evaluated all nonsafety-related SSCs, containing liquid or steam, and located in spaces containing safety-related SSCs. The applicant used a spaces approach to identify the nonsafety-related SSCs that were located within the same space as safety-related SSCs. As described in the LRA and for the purpose of the scoping review, a space was defined as a structure containing active or passive safety-related SSCs. In addition, the staff determined that following the identification of the applicable mechanical systems, the applicant identified its corresponding structures for potential spatial interaction, based on a review of the CLB and plant walkdowns. Nonsafety-related systems and components that contain liquid or steam and located inside structures that contain safety-related SSCs were included within the scope of license renewal, unless it was in an excluded space. The staff also determined that based on plant and industry operating experience, the applicant excluded the nonsafety-related SSCs containing air or gas from the scope of license renewal, with the exception of portions that are attached to safety-related SSCs and required for structural support. The staff confirmed that those nonsafety-related SSCs determined to contain liquid or steam and located within a space containing safety-related SSCs were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

LRA Section 2.1.2.5.5 states, "Abandoned equipment that is installed and connected to plant process pipes needs to be evaluated for non-safety attached to safety and non-safety affecting safety spatial interaction scoping criteria." However, during the scoping and screening methodology audit, the applicant indicated that not all abandoned equipment had been verified as disconnected and drained, yet this abandoned equipment had not been included within the scope of license renewal.

The staff determined that additional information would be required to complete the review of the applicant's scoping methodology. RAI 2.1-2, dated November 5, 2008, states that during the NRC scoping and screening methodology audit, the applicant stated that there were certain nonsafety-related abandoned equipment that were not included within the scope for license renewal in accordance with 10 CFR 54.4(a)(2). The staff requested the applicant provide a description of the methods used and the basis for conclusions, in determining that nonsafety-related abandoned systems and attached piping, which had not been verified as disconnected and drained, were not included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The applicant responded to RAI 2.1-2 by letter dated December 5, 2008, which states the applicant had performed field walkdowns to verify that an abandoned instrument air dryer and a caustic storage tank were disconnected and drained. The abandoned demineralizer head tank process pipe was also disconnected and drained; however, the overflow drain was still connected below grade. The applicant's review of the demineralizer head tank overflow drain concluded that it did not have the potential for spatial interaction with safety-related SSCs and was not included within the scope of license renewal. The applicant's response further states:

> Review of P&ID (Piping and Instrument Diagrams), isometric and physical drawings determined that the Steam Generator Blowdown Hold-Up Tank Filter #11 (Drawing LR-88740, location G-9) and #21 (Drawing LR-39250, location F-5) are disconnected from the process pipe. However, the drain lines, at valve BD-12-3 and BD-12-4 respectively, are still connected to the Waste Disposal (WD) System aerated drains. (Note: Drawing LR-39250, location F-5, incorrectly shows this drain line as capped at valve BD-12-4.) Due to the system configuration, complete draining of the piping and components could not be verified, and therefore these components are brought into the scope of license renewal based on the criteria of 10 CFR 54.4(a)(2). The SGB Hold-Up Tank Filters and their interconnected piping and valves are connected to and evaluated with the WD System. Addition of these components does not result in any changes to the LRA.
>
> Field walkdowns along with P&ID and physical drawing reviews determined that the Reactor Building Heating components (Drawing LR-39605-1, locations C-7 and B-9) are disconnected. Due to the system configuration, complete draining of the piping and components could not be verified. Therefore, these components are brought into the scope of license renewal based on the criteria of 10 CFR 54.4(a)(2).

The staff determined that the applicant had performed a walkdown of abandoned equipment to determine whether the systems were disconnected, potentially contained fluid, and whether the abandoned equipment could have an effect on safety-related SSCs located in the same space. The staff determined that the applicant appropriately identified two abandoned systems, which could potentially affect safety-related SSCs, and included these nonsafety-related SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The concern identified in RAI 2.1-2 is resolved.

2.1.4.2.3 Conclusion

On the basis of its review of the applicant's scoping process, discussions with the applicant, and review of the information provided in the response to RAI 2.1-2, the staff concludes that the applicant's methodology for identifying and including nonsafety-related SSCs, that could affect the performance of safety-related SSCs, within the scope of license renewal, 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

LRA Section 2.1.2.4.3, "Scoping Criterion 3-SSCs Required by Other Regulations Identified in 10 CFR Part 54," describes the methodology for identifying those systems and structures within the scope of license renewal in accordance with the Commission's criteria for five regulated events: (1) 10 CFR 50.48, "Fire Protection," (2) 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," (3) 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," (4) 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants," and (5) 10 CFR 50.63, "Loss of All Alternating Current Power."

<u>Fire Protection</u>. LRA Section 2.1.2.4.3, subsection "Fire Protection," described scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the fire protection criterion. The LRA states that consistent with the requirements specified in 10 CFR 54.4(a)(3), all SSCs relied upon to perform a function that demonstrates compliance with the regulations for fire protection (10 CFR 50.48) is within the scope of license renewal. LRA Section 2.1.2.4.3 further states that the Safe Shutdown Analysis, Fire Hazards Analysis Report, UFSAR, drawings, Operations Manual, and other PINGP source documents were used to identify SSCs which perform fire protection functions and which support fire protection equipment relied upon to achieve post-fire safe shutdown. A list of equipment was compiled from this review and was compared to a list of the equipment designated as fire protection or Appendix R related in the plant equipment database. Components and commodities included on the SSEL [safe shutdown equipment list] are in-scope for license renewal.

<u>Environmental Qualification</u>. LRA Section 2.1.2.4.3, subsection "Environmental Qualification (EQ)," described scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function in compliance with the EQ criterion. The LRA states that equipment was determined to be within the scope of license renewal in accordance with 10 CFR 50.49(b)(1), 10 CFR 50.49(b)(2), and 10 CFR 50.49(b)(3), including safety-related electrical equipment, nonsafety-related electrical equipment whose failure under postulated environmental conditions could prevent compliance with safety functions of the safety-related equipment, and certain post-accident monitoring equipment.

LRA Section 2.1.2.4.3 further states that electrical components, which meet these criteria for PINGP, are on the Environmental Qualification Master List (EQML) for 10 CFR 50.49. The EQML was developed to encompass the requirements identified in 10 CFR 50.49(b). Safety-related electrical equipment, nonsafety-related electrical equipment whose failure could prevent accomplishment of safety functions, and certain post-accident monitoring equipment were identified. The LRA further states that the EQML is the current component list of EQ components and is used as the basis for license renewal identification of EQ components for purposes of scoping and screening. Environmental qualification basis information is included in the PINGP UFSAR, Section 8.9. Consistent with the requirements specified in 10 CFR 54.4(a)(3), all SSCs relied upon to perform a function that demonstrates compliance with 10 CFR 50.49 are within the scope of license renewal.

Pressurized Thermal Shock. LRA Section 2.1.2.4.3, subsection "Pressurized Thermal Shock (PTS)," described scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function in compliance with the PTS criterion. The LRA Section 2.1.2.4.3 states that a Pressurized Thermal Shock (PTS) event is an event or transient in pressurized water reactors caused by severe overcooling (thermal shock) concurrent with or followed by significant pressure in the reactor vessel. A PTS concern arises if one of these transients acts on the beltline region of a reactor vessel where a reduced fracture resistance exists due to neutron irradiation. The LRA further states that per the requirements of 10 CFR 50.61 (PTS Rule), licensees of pressurized water reactors shall have projected values of reference temperature for pressurized thermal shock (RT_{PTS}), accepted by the NRC, for each reactor vessel beltline material for the end of life fluence of the material. The assessment of RT_{PTS} must use the calculation procedures and screening criteria given in the PTS Rule, and must specify the basis for the projected value of RT_{PTS}] for each vessel beltline material. The assessment must be updated whenever there is a significant change in projected values of RT_{PTS} or upon the request for a change in the expiration date for operation of the facility. LRA Section 2.1.2.4.3 further states the Unit 1 and 2 Reactor Vessels are considered to be within the scope of 10 CFR 54.4(a)(3) for PTS.

Anticipated Transient Without Scram. LRA Section 2.1.2.4.3, subsection "Anticipate Transients Without Scram (ATWS)," described scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function in compliance with the ATWS criterion. LRA Section 2.1.3.4.3 states that in December 1996, PINGP reviewed the design basis for the Auxiliary Feedwater System and determined that the existing pump low discharge pressure set point did not adequately protect the auxiliary feedwater pumps (AFWP) from runout conditions. PINGP determined that the preferred method for correction of this issue was the installation of a diverse scram system similar to that described in 10 CFR Part 50.62 for Combustion Engineering and Babcock & Wilcox plants. The ATWS Mitigating System Actuation Circuitry/Diverse Scram System (AMSAC/DSS) is described in UFSAR Section 7.11. ATWS Event analysis can be found in UFSAR Section 14.8. LRA Section 2.1.2.4.3 further states that as described in UFSAR Section 7.11.6, "A reactor trip, a turbine trip and auxiliary feedwater pump start are required AMSAC/DSS functions, with securing of steam generator blowdown and sampling as recommended outputs." Plant and vendor drawings, the UFSAR, docketed correspondence, modifications, and the plant equipment database were reviewed to identify components relied upon to mitigate the ATWS event. These components, relied upon to mitigate the ATWS event, are in-scope for license renewal.

Station Blackout. LRA Section 2.1.2.4.3, subsection "Station Blackout (SBO)," described scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function in compliance with the SBO criterion. LRA Section 2.1.2.4.3 states that SBO rule implementation details for PINGP are established in docketed correspondence, SERs, and supporting calculations. UFSAR Section 8.4 and Section 8.5 include summaries of the licensing criteria that are the CLB for resolution of this issue at PINGP. The LRA further states that in order to ensure a comprehensive list of SSCs required to satisfy 10 CFR 54.4(a)(3) for SBO was developed, the requirements and guidance associated with SBO implementation were reviewed to identify PINGP specific functional requirements and reliance on SSCs for 10 CFR 50.63 compliance. Components relied upon at PINGP to perform an SBO function were identified through a review of plant-specific SBO calculations, the UFSAR, drawings, modifications, and the plant equipment database.

LRA Section 2.1.2.4.3 further states that a review of one-line drawings and plant procedures for performing offsite power restoration was performed. Components explicitly relied upon in offsite power restoration procedures and their interconnections (busses, disconnect switches, etc.) are in-scope for license renewal. Components and commodities in-scope for license renewal are those from the plant 4.16kV busses, through and including the interconnecting transformers, disconnect switches, busses, etc., out to and including the switchyard devices that connect to offsite sources.

2.1.4.3.2 Staff Evaluation

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

The staff confirmed that the applicant's implementing procedures describe the process for identifying systems and structures within the scope of license renewal pursuant to 10 CFR 54.4.(a)(3). The procedures state that all mechanical systems and structures that perform functions addressed in 10 CFR 54.4(a)(3) are to be included within the scope of license renewal and that the results are to be documented in scoping results reports. The staff determined that the results reports reference the information sources used for determining the systems and structures credited for compliance with the events listed in the specified regulations.

Fire Protection. The staff determined that the applicant's implementing procedures indicated that it had included systems and structures in the scope of license renewal required for post-fire safe shutdown, fire detection and suppression, and commitments made to Appendix A to Branch Technical Position APCSB 9.5-1 (BTP 9.5-1), "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976," Issued May 1976. The applicant noted that it had considered CLB documents to identify systems and structures within the scope of license renewal. These documents included the UFSAR, Safe Shutdown Analysis, Fire Hazards Analysis Report, drawings, Operations Manual, and other PINGP source documents. The staff reviewed, on a sampling basis, the scoping results in conjunction with the LRA and CLB information to validate the methodology for including the proper systems and structures within the scope of license renewal. The sample review showed that the scoping results include systems and structures that perform intended functions to meet 10 CFR 50.48 requirements. Based on its review of the CLB documents and the sample review, the staff determined that the applicant's scoping methodology was adequate for including SSCs credited in performing fire protection functions within the scope of license renewal.

Environmental Qualification. The staff confirmed that the applicant's implementing procedures required the inclusion of safety-related electrical equipment, nonsafety-related electrical equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions of the safety-related equipment and certain post-accident monitoring equipment, as defined in 10 CFR 50.49(b)(1), (b)(2), and (b)(3). The staff determined that the applicant used the EQ master list to identify SCs necessary to meet the requirements of 10 CFR 50.49. The staff reviewed the LRA, implementing procedures, the EQ master list, and scoping results to verify that the applicant had identified SSCs within the scope of license renewal. Based on that review, the staff determined that the applicant's scoping methodology was adequate for identifying EQ SSCs within the scope of license renewal.

Pressurized Thermal Shock. The staff determined that the applicant's scoping methodology had required the applicant to review the activities performed to meet 10 CFR 50.61, which resulted in the inclusion of the Units 1 and 2 reactor vessels within the scope of license renewal pursuant to 10 CFR 54.4(a)(3). The staff reviewed the basis document and the implementing procedure and determined that the methodology was appropriate for identifying SSCs with functions credited for complying with the PTS regulation and within the scope of license renewal. The staff finds that the scoping results included the systems and structures that perform intended functions to meet the requirements of 10 CFR 50.61. Accordingly, the staff determined that the applicant's scoping methodology was adequate for including SSCs credited in meeting PTS requirements within the scope of license renewal.

Anticipated Transient Without Scram. The staff determined that the applicant had generated a list of plant systems credited for ATWS mitigation based on review of the plant and vendor drawings, the UFSAR, docketed correspondence, modifications, and the plant equipment database. The staff reviewed these documents and the LRA in conjunction with the scoping results to validate the methodology for identifying ATWS systems and structures that are within the scope of license renewal. The staff finds that the scoping results included systems and structures that perform intended functions meeting 10 CFR 50.62 requirements. The staff, therefore, determined that the applicant's scoping methodology was adequate for identifying SSCs with functions credited for complying with the ATWS regulation.

Station Blackout. The staff determined that the applicant identified those systems and structures associated with coping and safe shutdown of the plant following an SBO event by reviewing plant-specific SBO calculations, the UFSAR, drawings, modifications, the plant equipment database, and plant procedures. The staff reviewed on a sampling basis these documents and the LRA in conjunction with the scoping results to validate the applicant's methodology. The staff finds that the scoping results included systems and structures that perform intended functions meeting 10 CFR 50.63 requirements. The staff determined, based on its review, that the applicant's scoping methodology was adequate for identifying SSCs credited in complying with the SBO regulation within the scope of license renewal.

2.1.4.3.3 Conclusion

On the basis of the sample reviews, discussion with the applicant, review of the LRA, and review of the implementing procedures and reports, 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. LRA Section 2.1.2.1, “Scoping Process Overview,” states that the scoping process categorized the entire plant in terms of SSCs and commodity groups with respect to license renewal. SSC and commodity group functions were identified and evaluated against criteria provided in 10 CFR Part 54.4 (a)(1), (2), and (3) to determine whether the item should be considered within the scope of license renewal. Even if only a portion of an SSC or commodity fulfilled a scoping criterion, the item was identified as in-scope for license renewal and received further evaluation. Those SSCs or commodities identified as not meeting any scoping criterion were not further processed.

LRA Section 2.1.2.1 further states that the PINGP CLB documents, controlled drawings, and the plant equipment database were used for this review. Systems and components from the plant equipment database were included in the license renewal database population. Components in the plant equipment database were reviewed on a sampling basis to ensure systems, components, and commodity groups having potential to be considered in-scope for license renewal were not omitted. Additionally, plant walkdowns were conducted as necessary. In addition to the plant equipment database, the PINGP piping and instrumentation drawing (P&ID)s and other controlled drawings were used to identify components required to support system-level and structure-level license renewal functions.

LRA Section 2.1.2.5.4, "System Level Functions," [mechanical] states that the license renewal database, using the CLB resources discussed in LRA Section 2.1.1.1, was used to assign system level functions. LRA Section 2.1.1.1 "Plant Information Sources," states that the information sources included the UFSAR, plant equipment database, the Q-List and Q-List extension which were used to assign system-level functions. LRA Section 2.1.1.1 further states that the Q-List defines the SSCs subject to the requirements of 10 CFR 50, Appendix B and that the Q-List Extension further identifies safety-related and nonsafety-related substructures, subsystems, and component parts of Q-Listed items.

LRA Section 2.1.2.5, "Mechanical Scoping Methodology," states that license renewal system boundaries were initially based on the associated plant equipment database system designators and were then modified as needed through a system and component function review that used the UFSAR, P&IDs, DBDs, other drawings, docketed correspondence, and other design documents. The results were captured in the license renewal database and depicted on the license renewal Boundary Drawings (for mechanical systems). LRA Section 2.1.2.6.3, "Evaluation Boundaries," (structural) states that the civil/structural evaluation boundaries were defined by review of the UFSAR, plant site layout drawings, by plant walkdowns and by review of the location of in-scope mechanical and electrical systems and components needed to perform the system's intended functions.

LRA Section 2.1.2.7.1, "Discipline Specific Scoping Process," [electrical] states the electrical and instrumentation and control (EIC) components without a mechanical intended function, which are associated with EIC or mechanical systems were classified and processed as commodity groups. Since components from the EIC systems were addressed in the commodity groups, no system-level functions were identified or considered for the IPA. Therefore, no EIC systems were eliminated from scope.

Component Level Scoping. LRA Section 2.1.2.5.3, "Evaluation Boundaries," [mechanical] states that for mechanical systems, the evaluation boundaries were defined by tracing the flow paths needed to perform the system's intended functions. Components within these boundaries were considered to be within the scope of license renewal. LRA Section 2.1.2.6.3 states that a civil/structural license renewal boundary drawing was prepared to document the structures and components determined to be in-scope for license renewal. LRA Section 2.1.2.7.1 states that the EIC components without a mechanical intended function, which are associated with EIC or mechanical systems, were classified and processed as commodity groups.

Insulation. LRA Section 2.1.2.5.5, “Special Considerations,” states that thermal insulation that performs an intended function as identified in 10 CFR 54.4(a) was included in the scope of license renewal. The components involved are relied on in safety analyses, plant evaluations, or license conditions and meet the license renewal scoping criteria of 10 CFR 54.4(a)(1) or (a)(3).

Consumables. LRA Section 2.1.3.2.2, “Component Classification (passive, long-lived),” states that consumables are a special class of components that can include packing, gaskets, component seals, O-rings, structural sealants, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. Consumables were divided into the following four categories for the purpose of license renewal: (a) packing, gaskets, seals, and O-rings; (b) structural sealants; (c) oil, grease, and component filters; and (d) system filters, fire extinguishers, fire hoses, and air packs.

Group (a): LRA Section 2.1.3.2.2 states that packing, gaskets, component seals and O-rings are commonly found in components such as valves, pumps, heat exchangers, piping, dampers, and ducts. Based on ANSI B31.1.0 and the ASME B&PV Code Section III, these subcomponents are not pressure-retaining parts. Therefore, these subcomponents are not relied on to perform a pressure-retaining function or other intended function and are not subject to an AMR.

Group (b): LRA Section 2.1.3.2.2 states that structural sealants may perform functions without moving parts, or a change in configuration or properties, and they are not typically replaced. Those determined to perform component-intended functions in support of a larger structure were subject to an AMR.

Group (c): LRA Section 2.1.3.2.2 states that oil, grease and component filters are commonly found in components such as pumps, valves, diesel motors, fans, and dampers. These components are short-lived and are periodically replaced in accordance with procedures. Therefore, these components are not subject to an AMR.

Group (d): LRA Section 2.1.3.2.2 states that system filters, fire hoses, fire extinguishers, and air packs, are short-lived and are routinely tested, inspected, and replaced when necessary. System filters are monitored during testing and operation and are either replaced periodically or based on condition. Fire hoses and fire extinguishers are inspected and tested periodically and must be replaced if they do not pass the test or inspection. Breathing air apparatus and air cylinders are inspected and tested periodically and must be replaced if they do not pass the test or inspection. Criteria for inspection and replacement are based on accepted industry standards. Therefore, these components are not subject to an AMR. However, system filters or strainers that are not periodically replaced are subject to an AMR.

2.1.4.4.2 Staff Evaluation

The staff reviewed the applicant's methodology for performing the scoping of plant systems and components to ensure it was consistent with 10 CFR 54.4. The methodology used to determine the systems and components within the scope of license renewal was documented in implementing procedures and scoping results reports for systems. The scoping process defined the plant in terms of systems and structures. Specifically, the implementing procedures identified the systems and structures that are subject to 10 CFR 54.4 review, described the processes for capturing the results of the review, and were used to determine if the system or structure performed intended functions consistent with the criteria of 10 CFR 54.4(a). The process was completed for all systems and structures to ensure that the entire plant was addressed.

The applicant documented the results of the plant-level scoping process in accordance with the implementing documents. The results were provided in the systems and structures documents and reports that contained information that includes a description of the structure or system, a listing of functions performed by the system or structure, identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system or structure, references, and the basis for the classification of the system or structure intended functions. During the audit, the staff reviewed a sampling of the documents and reports and concluded that the applicant's scoping results contained an appropriate level of detail to document the scoping process.

2.1.4.4.3 Conclusion

Based on its review of the LRA, site guidance documents, and a sampling of system scoping results reviewed during the audit, the staff concludes that the applicant's methodology for identifying systems, structures, and components within the scope of license renewal, and their intended functions, is consistent with the requirements of 10 CFR 54.4 and, therefore, is acceptable.

2.1.4.5 Mechanical Component Scoping

2.1.4.5.1 Summary of Technical Information in the Application

In addition to the information previously discussed in SER Section 2.1.4.4.1, LRA Section 2.1.2.5 and subsections state that the mechanical discipline [personnel] were responsible for scoping evaluations for plant mechanical systems, including electrical and structural components contained in these systems (unless reassigned to another discipline). License renewal system boundaries were initially based on the associated plant equipment database system designators. These boundaries were then modified as needed through a system and component function review that used the UFSAR, P&IDs, DBDs, other drawings, docketed correspondence, and other design documents. Results were captured in the license renewal database and depicted on the license renewal boundary drawings for the mechanical components.

LRA Section 2.1.2.5 further states that components in the plant equipment database were input to the license renewal database. Additional components were added to the license renewal database when necessary. In some cases, asset groups were used where it was deemed efficient to process a single component type as one asset within a system, rather than many individual components having the same construction and function. The evaluation boundaries were defined by tracing the flow paths needed to perform the system's intended functions. Components within these boundaries are considered to be within the scope of license renewal. The license renewal database was used to assign system-level functions. Staged SSCs that are dedicated (reserved) for use in an application that, when installed, are relied upon to perform 10 CFR 54.4(a) intended functions, were included in the scope of license renewal.

2.1.4.5.2 Staff Evaluation

The staff evaluated LRA Section 2.1.4.4.1 and 2.1.2.5 and the guidance in the implementing procedures and reports to perform the review of the mechanical scoping process. The project documents and reports provided instructions for identifying the evaluation boundaries. Determination of the mechanical system evaluation boundary required an understanding of system operations in support of intended functions.

The staff determined that the process was based on the review of the UFSAR, DBDs, the plant equipment database, the Q-List and Q-List extension, NRC docketed correspondence and documents, and plant drawings. The evaluation boundaries for mechanical systems were documented on license renewal boundary drawings that were created by marking mechanical piping and instrumentation diagrams to indicate the components within the scope of license renewal. The staff determined that components within the evaluation boundary were reviewed to determine whether they perform an intended function. Intended functions were established based on whether a particular function of a component was necessary to support the system functions that meet the scoping criteria.

The staff reviewed the implementing documents and the CLB documents associated with mechanical system scoping, and finds 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 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 procedure was consistent with the description provided in the LRA Section 2.1.2.5 and the guidance contained in the SRP-LR, Section 2.1, and was adequately implemented.

On a sampling basis, the staff reviewed the applicant's scoping reports for the main steam system and decay heat removal system mechanical component types that met the scoping criteria of 10 CFR 54.4. The staff also reviewed the implementing procedures and discussed the methodology and results with the applicant. The staff verified that the applicant had identified and used pertinent engineering and licensing information in order to determine the main steam and residual heat removal system 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 main steam and residual heat removal systems, the basis for inclusion of the intended function, and the process used to identify each of the system component types. The staff verified that the applicant had identified and highlighted system P&IDs to develop the license renewal boundaries in accordance with the procedural guidance. Additionally, the staff determined that the applicant had independently verified the results in accordance with the governing procedures. The staff confirmed that the applicant had license renewal personnel knowledgeable about the system, and these personnel had performed independent reviews of the marked-up drawings to ensure accurate identification of system intended functions and that the applicant had 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

On the basis of its review of the LRA, scoping implementing procedures, and the sampling system review of mechanical scoping results, the staff concludes that the applicant's methodology for identifying mechanical SSCs within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4 and, therefore, is acceptable.

2.1.4.6 Structural Scoping

2.1.4.6.1 Summary of Technical Information in the Application

In addition to the information previously discussed in SER Section 2.1.4.4.1, LRA Section 2.1.2.6, "Civil/Structural Scoping Methodology," and subsections state that the civil/structural discipline [personnel] were responsible for the scoping evaluations for structures and structural commodity groups. The license applicant based its renewal civil/structural boundaries on the associated plant equipment database system designators and on the UFSAR classification. However, because very few structural elements are included in the plant equipment database, the applicant used the PINGP Structures Monitoring Program, UFSAR, DBDs, drawings, procedures, and walkdowns were used to develop a more comprehensive list of structures and commodity groups for license renewal.

LRA Section 2.1.2.6 and subsections further state that system-level functions and associated 10 CFR Part 54 criteria applicable to the structure were identified during scoping. Information sources included the UFSAR, CLB documentation, DBDs, training materials, plant equipment database, drawings, specifications, codes/standards, design changes, procedures, and walkdowns of plant buildings.

2.1.4.6.2 Staff Evaluation

The staff evaluated LRA Sections 2.1.4.4.1 and 2.1.2.6, and subsections, and the guidance contained in the implementing procedures and reports to perform the review of structural scoping process. The staff reviewed the applicant's approach to identifying structures relied upon to perform the functions described in 10 CFR 54.4(a). As part of this review, the staff discussed the methodology with the applicant, reviewed the documentation developed to support the review, and evaluated the scoping results for a sample of structures that were identified within the scope of license renewal. The staff determined that the applicant had identified and developed a list of plant structures and the structures intended functions through a review of the plant equipment database, the PINGP Structures Monitoring Program, UFSAR, DBDs, drawings, procedures, and walkdowns. Each structure the applicant identified was evaluated against the criteria of 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

The staff reviewed selected portions of the plant equipment database, the PINGP Structures Monitoring Program, UFSAR, DBDs, drawings, procedures, and implementing procedures to verify the adequacy of the methodology. The staff reviewed the applicant's methodology for identifying structures meeting the scoping criteria as defined in the Rule. The staff also reviewed the scoping methodology implementing procedures, and discussed the methodology and results with the applicant. In addition, the staff reviewed on a sampling basis the applicant's scoping reports, including information contained in the source documentation, for the turbine building and the screen house to verify that application of the methodology would provide the results as documented in the LRA. The staff verified that the applicant had identified and used pertinent engineering and licensing information in order to determine that the turbine building and the screen house were required to be included within the scope of license renewal. As part of the review process, the staff evaluated the intended functions identified for the turbine building and the screen house and the structural components, the basis for inclusion of the intended function, and the process used to identify each of the component types.

2.1.4.6.3 Conclusion

On the basis of its review of information in the LRA and supporting documents, scoping implementing procedures, and a sampling review of structural scoping results, the staff concludes that the applicant's methodology for identification of the structural SSCs within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4 and, therefore, is acceptable.

2.1.4.7 Electrical Component Scoping

2.1.4.7.1 Summary of Technical Information in the Application

In addition to the information previously discussed in Section 2.1.4.4.1, LRA Section 2.1.2.7, "Electrical/I&C Scoping Methodology," and subsections state that the EIC components without a mechanical intended function, that are associated with EIC or mechanical systems, were classified and processed as commodity groups. The applicant stated that it formed commodity groups from components that were constructed from similar materials, exposed to similar environments, or performed similar intended functions regardless of the specific system or structure to which they were originally assigned. Since components from the EIC systems were addressed in the commodity groups, the applicant stated that no system-level functions were identified or considered for the IPA. Therefore, no EIC systems were eliminated from scope.

LRA Section 2.1.2.7 and subsections state that information regarding the EIC commodities was identified from review of the UFSAR, plant equipment database, CLB documentation, DBDs, databases and documents, procedures, drawings, specifications, codes/standards, and system walkdowns. The applicant classified and processed the EIC components belonging to EIC commodities as commodities utilizing the In-Scope Bounding Approach (Plant Spaces Approach). The commodity classifications were based on NEI 95-10 Appendix B as a guideline. The applicant's general approach was to assume that EIC commodities are in-scope for criteria 10 CFR 54.4(a)(1), (2) and (3).

2.1.4.7.2 Staff Evaluation

The staff evaluated LRA Sections 2.1.4.4.1 and 2.1.2.7, and subsections, and the guidance contained in the implementing procedures and reports to perform the review of the electrical scoping process. The staff reviewed the applicant's approach to identifying electrical and instrumentation and controls (I&C) SSCs relied upon to perform the functions described in 10 CFR 54.4(a). The staff reviewed portions of the documentation used by the applicant to perform the electrical scoping process including the UFSAR, plant equipment database, CLB documentation, DBDs, databases and documents, procedures, drawings, specifications, and codes/standards. As part of this review, the staff discussed the methodology with the applicant, reviewed the implementing procedures developed to support the review, and evaluated the scoping results for a sample of SSCs that were identified within the scope of license renewal. The staff determined that the applicant had included EIC components and also EIC components contained in mechanical or structural systems within the scope of license renewal on a commodity basis.

2.1.4.7.3 Conclusion

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

2.1.4.8 Scoping Methodology Conclusion

On the basis of its review of the LRA, scoping implementing procedures, and a sampling review of scoping results, the staff concludes that the applicant's scoping methodology was consistent with the guidance contained in the SRP-LR and identified those SSCs (1) that are safety-related, (2) whose failure could affect safety-related functions, and (3) that are necessary to demonstrate compliance with the NRC's regulations for fire protection, EQ, PTS ATWS, and SBO. The staff concluded 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

2.1.5.1.1 Summary of Technical Information in the Application

LRA Section 2.1.3.2, "General Screening Methodology," and subsections state that the screening process identifies the structures and components within the scope of license renewal that are subject to an Aging Management Review [AMR]. These structures and components are those that perform or support an intended function in support of the Systems, Structures or Commodity Group function(s) without moving parts or without a change in configuration or properties (referred to as passive) and are not subject to replacement based on qualified life or specified time period (referred to as long-lived). A component level intended function is one that supports the system level intended function; the plant systems, structures, and commodity groups that are within the scope of license renewal and their system level intended functions were previously identified during the scoping process. The screening process consists of identification of the components that are subject to an AMR (passive and long-lived) within the scope of license renewal and identification of the component level intended functions for equipment subject to an AMR. LRA Section 2.1.3.2 and subsections further state that the components (or commodity groups) that are subject to an AMR are those that perform a component level intended function without moving parts or a change in configuration or properties and are not subject to replacement based on a qualified life or specified frequency.

2.1.5.1.2 Staff Evaluation

Pursuant to 10 CFR 54.21, each LRA must contain an IPA that identifies SCs within the scope of license renewal that are subject to an AMR. The IPA must identify components that perform an intended function without moving parts or a change in configuration or properties (passive), as well as components that are not subject to periodic replacement based on a qualified life or specified time period (long-lived). In addition, the IPA must include 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 identify the mechanical and structural components and electrical commodity groups within the scope of license renewal that should be subject to an AMR. The applicant implemented a process for determining which SCs were subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). In LRA Section 2.1.3.2 and subsections, the applicant discusses these screening activities as they related to the component types and commodity groups within the scope of license renewal.

The staff determined that the screening process evaluated the component types and commodity groups, included within the scope of license renewal, to determine which ones were long-lived and passive and therefore subject to an AMR. The staff reviewed LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems,” LRA Section 2.4, “Scoping and Screening Results: Containment, Structures, and Component Supports,” and LRA Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Control Systems.” These sections of the LRA that provided the results of the process used to identify component types and commodity groups subject to an AMR. The staff also reviewed on a sampling basis the screening results reports for the main steam system, the residual heat removal system, the turbine building and the screen house.

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 component screening is discussed below.

2.1.5.1.3 Conclusion

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

2.1.5.2 Mechanical Component Screening

2.1.5.2.1 Summary of Technical Information in the Application

LRA Sections 2.1.3.2 and subsections, and 2.1.3.3, "Mechanical Screening Methodology," and subsections state that the screening process identifies the mechanical components within the scope of license renewal that are subject to an AMR. These structures and components are those that perform or support an intended function in support of the Systems, Structures or Commodity Group function(s) without moving parts or without a change in configuration or properties (referred to as passive) and are not subject to replacement based on qualified life or specified time period (referred to as long-lived). A component level intended function is one that supports the system level intended function; the plant systems, structures, and commodity groups that are within the scope of license renewal and their system level intended functions were previously identified during the scoping process. The screening process consists of identification of the components that are subject to an AMR (passive and long-lived) within the scope of license renewal and identification of the component level intended functions for equipment subject to an AMR. LRA Section 2.1.3.2 and subsections further state that the components (or commodity groups) that are subject to an AMR are those that perform a component level intended function without moving parts or a change in configuration or properties and are not subject to replacement based on a qualified life or specified frequency. LRA Section 2.1.3.3 states that when assigning component level license renewal intended functions, some components had more than one intended function.

2.1.5.2.2 Staff Evaluation

The staff reviewed the mechanical screening methodology discussed and documented in LRA Sections 2.1.3.2 and subsections, and 2.1.3.3 and subsections, the implementing documents, the scoping and screening reports, and the license renewal drawings. The staff determined that the mechanical system screening process began with the results from the scoping process and that the applicant reviewed each system evaluation boundary as illustrated on P&IDs to identify passive and long-lived components. In addition, the staff determined that the applicant had identified all passive, long-lived components that perform or support an intended function within the system evaluation boundaries and determined those components to be subject to an AMR. The results of the review were documented in the scoping and screening reports, which contain information such as the information sources reviewed and the component intended functions.

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

The staff reviewed selected portions of the UFSAR, plant equipment database, CLB documentation, DBDs, databases and documents, procedures, drawings, specifications, and codes/standards and selected scoping and screening reports. 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 mechanical screening methodology outlined in the LRA and procedures was appropriately implemented and if the scoping results were consistent with CLB requirements. During the scoping and screening methodology audit, the staff discussed the screening methodology with the applicant and, on a sampling basis, reviewed the applicant's screening reports for the main steam and residual heat removal systems to verify proper implementation of the screening process. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.2.3 Conclusion

On the basis of its review of the LRA, the screening implementing procedures, selected portions of the UFSAR, plant equipment database, CLB documentation, DBDs, databases and documents, procedures, drawings, specifications, codes/standards and selected scoping and screening reports, and a sample of the main steam and residual heat removal systems screening results, the staff concludes that the applicant's methodology for identification of mechanical components within the scope of license renewal and subject to an AMR is in accordance with the requirements of 10 CFR 54.21(a)(1) and therefore is acceptable.

2.1.5.3 Structural Component Screening

2.1.5.3.1 Summary of Technical Information in the Application

LRA Sections 2.1.3.2 and subsections, and 2.1.3.4, "Civil/Structural Screening Methodology," and subsections, state that the screening process identifies structural components within the scope of license renewal that are subject to an AMR. These structures and components are those that perform or support an intended function in support of the Systems, Structures or Commodity Group function(s) without moving parts or without a change in configuration or properties (referred to as passive) and are not subject to replacement based on qualified life or specified time period (referred to as long-lived). A component level intended function is one that supports the system level intended function; the plant systems, structures, and commodity groups that are within the scope of license renewal and their system level intended functions were previously identified during the scoping process. The screening process consists of identification of the components that are subject to an AMR (passive and long-lived) within the scope of license renewal and identification of the component level intended functions for equipment subject to an AMR.

2.1.5.3.2 Staff Evaluation

The staff reviewed the structural screening methodology discussed and documented in LRA Sections 2.1.3.2 and subsections, and 2.1.3.4 and subsections, the implementing procedures, the scoping and screening reports, and the license renewal drawings. 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). The staff confirmed that the applicant had reviewed the structures included within the scope of license renewal and identified the passive, long-lived components with component level intended functions and determined those components to be subject to an AMR.

The staff reviewed selected portions of the UFSAR, PINGP structures monitoring program documentation, DBDs, and scoping and screening reports, which the applicant had used to perform the structural scoping and screening activities. The staff also reviewed on a sampling basis the civil/structural boundary drawing to document the structures and components within the scope of license renewal. The staff conducted detailed discussions with the applicant's license renewal team and reviewed documentation pertinent to the screening process to assess if the screening methodology outlined in the LRA and implementing procedures was appropriately implemented and if the scoping results were consistent with CLB requirements. During the scoping and screening methodology audit, the staff reviewed on a sampling basis the applicant's screening reports for the turbine building and the screenhouse to verify proper implementation of the screening process. Based on these onsite review 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 the LRA, implementing procedures, the UFSAR, the PINGP structures monitoring program documentation, DBDs, and scoping and screening reports, and a sampling review of the turbine building and screen house screening results, the staff concludes that the applicant's methodology for identification of structural components within the scope of license renewal and subject to an AMR is in accordance with the requirements of 10 CFR 54.21(a)(1) and therefore is acceptable.

2.1.5.4 Electrical Component Screening

2.1.5.4.1 Summary of Technical Information in the Application

LRA Sections 2.1.3.2 and subsections, and 2.1.3.5, "Electrical/I&C Screening Methodology," and subsections, state that the screening process identifies the components within the scope of license renewal that are subject to an AMR. These structures and components are those that perform or support an intended function in support of the Systems, Structures, or Commodity Group function(s) without moving parts or without a change in configuration or properties (referred to as passive) and are not subject to replacement based on qualified life or specified time period (referred to as long-lived). A component level intended function is one that supports the system level intended function; the plant systems, structures, and commodity groups that are within the scope of license renewal and their system level intended functions were previously identified during the scoping process. The screening process consists of identification of the components that are subject to an AMR (passive and long-lived) within the scope of license renewal and identification of the component level intended functions for equipment subject to an AMR.

LRA Section 2.1.3.5 and subsections further state that PINGP elected to include, as a commodity, insulated cable and connections within the scope of license renewal because of the complexity of identifying whether or not an individual insulated cable or connection supports an intended function. However, when individual cables and connections were identified during the AMR process as EQ, or as not providing an intended function, no further AMR was conducted. The applicant explained that the screening process completed the asset identification process, verified the identification of component types, and evaluated each of the component types against the screening criteria. The screening process evaluation also identified the component level intended functions that were assigned to component types in accordance with NEI 95-10 and NUREG-1801. Following the development of a list of electrical commodity groups, the applicant screened out and removed from further consideration those commodity groups classified as active (from NEI 95-10, Appendix B). The applicant organized the remaining components into AMR commodity groups for AMR.

LRA Section 2.1.3.5.1, “Screening of Electrical Components,” lists that the resulting AMR electrical commodity groups of long-lived passive components subject to an AMR are as follows:

- Cables and Connections (Insulation), includes splices, terminations, fuse blocks and connectors
- Cables and Connections Used in Instrumentation Circuits (Insulation),sensitive to reduction in conductor insulation resistance
- Inaccessible Medium Voltage Cables and Connections (Insulation),underground, buried
- Electrical Connector Contacts (metallic connector pins exposed to borated water)
- Electrical Penetrations (electrical insulation portions)
- Metal Enclosed Bus and Connections (Bus/Connections, Enclosure Assemblies, Insulation/Insulators)
- Fuse Holders (metallic parts), not part of a larger active assembly
- Cable Connections (metallic parts)
- Switchyard Bus and Connections
- Transmission Conductors and Connections
- High-Voltage Insulators

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant’s methodology used for electrical screening in LRA Sections 2.1.3.2 and subsections, and 2.1.3.5 and subsections, implementing procedures, bases documents, and electrical screening report. The staff confirmed that the applicant used the screening process described in these documents along with the information contained in NEI 95-10 Appendix B and the SRP-LR, to identify the electrical and I&C components subject to an AMR.

The staff determined that the applicant had identified commodity groups, which were found to meet the passive criteria in accordance with NEI 95-10. In addition, the staff saw that the applicant evaluated the identified, passive commodities to identify whether they were subject to replacement based on a qualified life or specified time period (short-lived), or not subject to replacement based on a qualified life or specified time period (long-lived) and that the remaining passive, long-lived components were determined to be subject to an AMR.

The staff checked to see whether if the screening methodology outlined in the LRA and implementing procedures were appropriately implemented and if the scoping results were consistent with CLB requirements. During the scoping and screening methodology audit, the staff reviewed selected screening reports to verify proper implementation of the screening process. Based on these onsite review activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.4.3 Conclusion

On the basis of its review of the LRA, implementing procedures, plant drawings, and a sample of the results of the screening methodology, the staff concludes that the applicant's methodology for identification of electrical components within the scope of license renewal and subject to an AMR is in accordance with the requirements of 10 CFR 54.21(a)(1) and, therefore, is acceptable.

2.1.5.5 Screening Methodology Conclusion

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

2.1.6 Summary of Evaluation Findings

On the basis of its 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, the staff confirms that the applicant's scoping and screening methodology is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff also concludes that the applicant's description and justification of its scoping and screening methodology are adequate to meet the requirements of 10 CFR 54.21(a)(1). From this review, the staff concludes that the applicant's methodology for identifying systems and structures within the scope of license renewal and SCs requiring an AMR is acceptable.

2.2 Plant-Level Scoping Results

2.2.1 Introduction

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

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

2.2.2 Summary of Technical Information in the Application

LRA Table 2.2-1 lists those mechanical systems, electrical and I&C systems, and structures that are within the scope of license renewal. Also in LRA Table 2.2-1, the applicant listed the systems and structures that do not meet the criteria specified in 10 CFR 54.4(a) and are excluded from the scope of license renewal. Based on the DBEs considered in the CLB, other CLB information relating to nonsafety-related systems and structures, and certain regulated events, the applicant identified plant-level systems and structures within the scope of license renewal as defined by 10 CFR 54.4.

2.2.3 Staff Evaluation

In LRA Section 2.1, the applicant described its methodology for identifying systems and structures within the scope of license renewal and subject to an AMR. The staff reviewed the scoping and screening methodology and provides its evaluation in SER Section 2.1. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results shown in LRA Tables 2.2-1, 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 2.2-01, dated November 5, 2008, the staff noted that the shield building ventilation system is addressed in LRA Section 2.3.3.14; however, the shield building special ventilation system cannot be found in the LRA. The staff asked the applicant to clarify that the shield building special ventilation system of LRA Section 2.3.3.6 and UFSAR Section 1.3.9 is the same system as the shield building ventilation subsystem described in LRA Section 2.3.3.14, or to provide the reasoning for not including the shield building special ventilation system in LRA Table 2.2-1.

In its response, dated December 5, 2008, the applicant stated that LRA Section 2.3.3.6 and UFSAR Section 1.3.9.f.2, "Shield Building Special Ventilation System," is the same system described in LRA Section 2.3.3.14.

Based on its review, the staff finds the applicant's response to RAI 2.2-01 acceptable because it confirms that the shield building special ventilation system described in LRA Section 2.3.3.6 and UFSAR Section 1.3.9.f.2 is the same system as the shield building ventilation subsystem described in LRA Section 2.3.3.14 and thus been addressed for scoping and screening purposes. Therefore, the staff's concern described in RAI 2.2-01 is resolved.

In RAI 2.2-02, dated November 5, 2008, the staff noted that the chemical lab and counting room ventilation system identified in UFSAR Table 12.2-1 could not be found in the LRA. The staff asked the applicant to clarify that the cold chemical lab of LRA Section 2.3.3.19 is the same system as the chemical lab and counting room ventilation system identified in UFSAR Table 12.2-1 or to provide the reasoning for not including the chemical lab and counting room ventilation system in LRA Table 2.2-1.

In its response, dated December 5, 2008, the applicant stated the chemical lab and counting room ventilation system identified in UFSAR Table 12.2-1 is the same system described in LRA Section 2.3.3.1 as the hot lab/sample room ventilation subsystem.

Based on its review, the staff finds the applicant's response to RAI 2.2-02 acceptable because the chemical lab and counting room ventilation system identified in UFSAR Table 12.2-1 is the same system described LRA Section 2.3.3.1 as the hot lab/sample room ventilation subsystem and thus has been addressed for scoping and screening purposes. Therefore, the staff's concern described in RAI 2.2-02 is resolved.

In RAI 2.2-03, dated November 5, 2008, the staff noted that the generator cooling water system identified in UFSAR Table 12.2-1 could not be located in LRA Table 2.2-1. The applicant was requested to provide the reasoning for not including the generator cooling water system in Table 2.2-1.

In its response, dated December 5, 2008, the applicant stated the generator cooling water system identified in UFSAR Table 12.2-1 is evaluated as part of LRA Section 2.3.4.8, "Turbine Generator and Support (TB) System," and LRA Section 2.3.3.6, "Cooling Water (CL) System."

Based on its review, the staff finds the applicant's response to RAI 2.2-03 acceptable because the generator cooling water system identified in UFSAR Table 12.2-1 is evaluated as part of the LRA Sections 2.3.4.8, "Turbine Generator and Support (TB) System," and 2.3.3.6, "Cooling Water (CL) System." Therefore, the staff's concern described in RAI 2.2-03 is resolved.

In RAI 2.2-04, dated November 5, 2008, the staff noted that the reactor gap cooling, reactor refueling cavity ventilation, and reactor support cooling systems identified in UFSAR Table 12.2-1 could not be located in LRA Table 2.2-1, "Plant Level Scoping Results." The staff asked the applicant to provide the reasoning for not including the reactor gap cooling, reactor refueling cavity ventilation and reactor support cooling systems in LRA Table 2.2-1.

In its response, dated December 5, 2008, the applicant stated the reactor gap cooling and reactor support cooling systems identified in UFSAR Table 12.2-1 are the same systems identified as reactor cavity cooling and reactor vessel support pad cooling subsystems identified respectively in LRA Section 2.3.3.14. The applicant explained that the reactor refueling cavity ventilation system identified in UFSAR Table 12.2-1 is no longer installed and therefore does not need to be included in the PINGP LRA.

Based on its review, the staff finds the applicant's response to RAI 2.2-04 acceptable because the reactor gap cooling and reactor support cooling systems identified in UFSAR Table 12.2-1 are the same systems identified as reactor cavity cooling and reactor vessel support pad cooling subsystems identified respectively in LRA Section 2.3.3.14, and thus have been addressed for scoping and screening purposes. Because the reactor refueling cavity ventilation system is no longer installed, scoping and screening is not applicable to it. Therefore, the staff's concern described in RAI 2.2-04 is resolved.

In RAI 2.2-05, dated November 5, 2008, the staff noted that the acoustic monitoring and seismic monitoring systems identified in UFSAR Sections 4.4.2.4 and 7.9.3 respectively could not be located in LRA Table 2.2-1. The staff asked the applicant to explain why the acoustic monitoring and seismic monitoring systems were not listed in Table 2.2-1.

In its December 5, 2008 response, the applicant stated that the acoustic monitoring system components were initially included in the electrical event monitoring system. The seismic monitoring system components were initially included in the electrical miscellaneous plant instruments system. Components of these systems are now grouped in the electrical and I&C commodities with no system level intended functions identified in the LRA. The event monitoring and miscellaneous plant instruments system scoping results are presented in Table 2.2-1, Plant Level Scoping Results.

Based on its review, the staff finds the applicant's response to RAI 2.2-05 acceptable because the acoustic monitoring system components are included in the event monitoring system and the seismic monitoring system is included in the miscellaneous plant instruments system with the scoping results in Table 2.2-1. Therefore, the staff's concern described in RAI 2.2-05 is resolved.

2.2.4 Conclusion

The staff reviewed LRA Section 2.2, the RAI responses, and the FSAR 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, as discussed above, 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.

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 the following:

- reactor vessel, internals, and reactor coolant system (RCS)
- engineered safety features
- auxiliary systems
- steam and power conversion systems

The 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 section in the SER, which specifically addresses the applicant's responses to the RAI(s).

In accordance with the requirement 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 verify that the applicant identified all mechanical system SCs that met the scoping criteria and were subject to an AMR, and to confirm that there were no omissions.

The staff's evaluation was performed using the evaluation methodology described here, the guidance in SRP-LR Section 2.3, and took into account (where applicable) the system functions(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 its scoping evaluation, the staff reviewed the LRA, applicable sections of the 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 relevant licensing basis documents for each mechanical system to confirm that the applicant specified all intended functions defined by 10 CFR 54.4(a). The review then focused on identifying any components with intended functions defined by 10 CFR 54.4(a) that the applicant may have omitted from the scope of license renewal.

After reviewing the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions delineated under 10 CFR 54.4(a), the staff verified the applicant properly screened out only: (1) SCs that have functions performed with moving parts or a change in configuration or properties; or (2) SCs that are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). For SCs not meeting either of these criteria, the staff confirmed the remaining SCs received an AMR, as required by 10 CFR 54.21(a)(1). The staff requested additional information to resolve any omissions or discrepancies identified.

2.3.1 Reactor Vessel, Internals, and Reactor Coolant System

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

2.3.1.1 Pressurizer System

2.3.1.2 Reactor Coolant System

2.3.1.3 Reactor Internals System

2.3.1.4 Reactor Vessel System

2.3.1.5 Steam Generator System

The staff's findings on review of LRA Sections 2.3.1.1 – 2.3.1.5 are in SER Sections 2.3.1.1 – 2.3.1.5, respectively.

2.3.1.1 Pressurizer System

2.3.1.1.1 Summary of Technical Information in the Application

LRA Section 2.3.1.1 describes the pressurizer system (PS). The PS is designed to maintain the required reactor coolant pressure during steady-state operation, limit the pressure changes caused by coolant thermal expansion and contraction during normal load transients, and prevents the pressure in the RCS from exceeding the design pressure. The PS consists of the pressurizer vessel, replaceable direct immersion heaters, a spray head, and other internal components. The surge line attached to the bottom of the pressurizer connects the pressurizer to the hot leg of a reactor coolant loop. In LRA Table 2.3.1-1, the applicant identifies the components it believes are subject to AMR for the PS by component type and intended function.

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 the applicant has appropriately identified the PS 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.1.2 Reactor Coolant System

2.3.1.2.1 Summary of Technical Information in the Application

LRA Section 2.3.1.2 describes the RCS. The RCS consists of two identical heat transfer loops connected in parallel to the reactor vessel. Each loop contains a reactor coolant pump, a steam generator, and a resistance temperature detector manifold. The RCS also includes pressurizer safety and relief valves, and a pressurizer relief tank, which provides operational pressure control. The pressurizer relief system is connected to the RCS by a surge line to accommodate volume changes of the coolant due to changes in coolant temperature. Borated demineralized water is circulated at a flow rate and temperature to achieve the proper reactor core thermal hydraulic performance. The RCS provides a boundary for containing the coolant under operating temperature and pressure conditions. It also serves to confine radioactive material and limit to acceptable values any release of radioactive material. In LRA Table 2.3.1-2, the applicant identifies the components it believes are subject to AMR for the RCS by component type and intended function.

2.3.1.2.2 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 the applicant has appropriately identified the RCS 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.1.3 Reactor Internals System

2.3.1.3.1 Summary of Technical Information in the Application

LRA Section 2.3.1.3 describes the reactor internals system. The reactor internals system consists of the reactor vessel internals and reactor core, which includes the Nuclear Fuel subsystem. The reactor internals, consisting of the upper and lower core support structure, are designed to support, align, and guide the core components, direct the coolant flow to and from the core components, and to support and guide the in-core instrumentation. The reactor core, consisting of the fuel assemblies and control rods, provides and controls the heat source for the reactor operation. All reactor internals are removable from the vessel for the purpose of their inspection as well as the inspection of the vessel internal surface. In LRA Table 2.3.1-3, the applicant identifies the components it believes are subject to AMR for the reactor internals system by component type and intended function.

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 the applicant has appropriately identified the reactor internals 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.1.4 Reactor Vessel System

2.3.1.4.1 Summary of Technical Information in the Application

LRA Section 2.3.1.4 describes the reactor vessel system. The reactor vessel is a vertical, cylindrical pressure vessel with a hemispherical bottom head and a flanged and gasketed, removable, upper closure head. The reactor vessel contains the core, core support structures, control rods, and other vessel internals associated with the core. Two metallic O-rings seal the reactor vessel when the reactor closure head is bolted in space. Control rod drive mechanisms (CRDMs) are positioned on the reactor closure head. The in-core instrumentation subsystem consists of stainless steel tubes that extend from the bottom of the reactor vessel down through the concrete shield area and up to a thimble seal table. There are two inlet and outlet nozzles spaced evenly around the vessel through which reactor coolant flows into and out of the reactor vessel. In LRA Table 2.3.1-4, the applicant identifies the components it believes are subject to AMR for the reactor vessel system by component type and intended function.

2.3.1.4.2 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 the applicant has appropriately identified the reactor vessel 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.1.5 Steam Generator System

2.3.1.5.1 Summary of Technical Information in the Application

LRA Section 2.3.1.5 describes the steam generator (SG) system. The SG system transfers heat from the RCS to the secondary systems during normal plant conditions, producing steam for use in the turbine generator. The SG system consists of two vertical shell and U-tube steam generators and the associated components. The Unit 1 SGs were designed and supplied by Framatome-ANP. The Unit 2 SGs were designed and supplied by Westinghouse. The heat transfer tubes are Inconel Alloy 690 for Unit 1 and Inconel Alloy 600 for Unit 2. Manways are provided to permit access to the U-tubes and moisture separating equipment. The steam-water mixture from the tube bundle passes through moisture separator equipment to ensure that high-quality steam is produced by the SGs. In LRA Table 2.3.1-5, the applicant identifies the components it believes are subject to AMR for the SG system by component type and intended function.

2.3.1.5.2 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 the applicant has appropriately identified the SG 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2 Engineered Safety Features

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

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

- 2.3.2.1 Containment Spray System
- 2.3.2.2 Residual Heat Removal System
- 2.3.2.3 Safety Injection System

The staff's findings on review of LRA Sections 2.3.2.1–2.3.2.3 are in SER Sections 2.3.2.1–2.3.2.3, respectively.

2.3.2.1 Containment Spray System

2.3.2.1.1 Summary of Technical Information in the Application

LRA Section 2.3.2.1 describes the containment spray (CS) system. The CS system is a standby system. It includes the caustic addition subsystem designed to add a caustic solution (sodium hydroxide (NaOH)) to the spray water to reduce the probability of stress corrosion cracking of stainless steel residual heat (RH) system components during the recirculation phase and to enhance the iodine absorption capacity of the containment spray. The CS system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the CS system potentially could prevent the satisfactory accomplishment of a safety-related function. In LRA Table 2.3.2-1, the applicant identifies CS system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.2.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.1, UFSAR Sections 6.3.1.5, 6.4.1, 6.4.2.1, 6.4.3.2, 14.9.6.3, and the license 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 2.3.2.1-01 and 2.3.2.1-02, dated December 16, 2008, the staff noted instances where boundary drawings identified as not within the scope of license renewal the following components: a valve, its attached piping, and end cap, and a piping with end cap. These items are attached to piping that is within the scope of license renewal. The staff asked the applicant to provide additional information clarifying why these items are not within the scope of license renewal.

In its response, dated January 15, 2009, the applicant stated that the valve, its attached piping, and end cap, and the piping with end cap, should be in the scope of license renewal per 10 CFR 54.4(a)(1).

The staff reviewed the applicant's responses. The staff finds the applicant's responses to the RAIs 2.3.2.1-01 and 2.3.2.1-02 acceptable because the applicant clarified the status of items and added them to the scope of license renewal. Therefore, the staff's concerns described in RAIs 2.3.2.1-01 and 2.3.2.1-02 are resolved.

2.3.2.1.3 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 containment spray 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 spray system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.2 Residual Heat Removal System

2.3.2.2.1 Summary of Technical Information in the Application

LRA Section 2.3.2.2 describes the residual heat removal (RHR) system. The RHR is a standby system. It consists of two redundant subsystems, each of which includes one pump and one heat exchanger, and associated piping, valves and instrumentation. The RHR system is an engineered safety system that serves dual functions. The RHR system removes residual and sensible heat from the reactor core during shutdown and reduces the temperature of the RCS during plant cooldown and shutdown operations. During accident conditions, the RHR system is aligned to take suction from the RWST to provide emergency core cooling low head safety injection. It is also used to fill and drain the refueling cavity during plant shutdown conditions. In LRA Table 2.3.2-2, the applicant identifies the components it believes are subject to AMR for the RHR system by component type and intended function.

2.3.2.2.2 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 the 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.3 Safety Injection System

2.3.2.3.1 Summary of Technical Information in the Application

LRA Section 2.3.2.3 describes the safety injection (SI) system. The SI system is an engineered safety system used for emergency core cooling to deliver borated cooling water to the reactor core in the event of a loss-of-coolant accident. This limits the fuel clad temperature and ensures that the core will remain intact and in place with its heat transfer geometry preserved. The SI system for each unit consists of two accumulators, a refueling water storage tank and two safety injection pumps. The RWST supplies borated water to the refueling cavity and SI accumulators. It also provides borated water to the safety injection pumps, residual heat removal pumps, and the containment spray pumps during accident conditions. After the injection phase, coolant spilled from the break is cooled and returned to the RCS by the RHR system. During the high head recirculation phase, suction to a safety injection pump is provided by the associated heat removal pump. In LRA Table 2.3.2-3, the applicant identifies the components it believes are subject to AMR for the SI system by component type and intended function.

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 the applicant has appropriately identified the SI 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

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

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

2.3.3.1 Auxiliary and Radwaste Area Ventilation System
2.3.3.2 Chemical and Volume Control System
2.3.3.3 Component Cooling Water System
2.3.3.4 Containment Hydrogen Control System
2.3.3.5 Control Room and Miscellaneous Area Ventilation System
2.3.3.6 Cooling Water System
2.3.3.7 Diesel Generator and Screenhouse Ventilation System
2.3.3.8 Diesel Generators and Support System
2.3.3.9 Fire Protection System
2.3.3.10 Fuel Oil System
2.3.3.11 Heating System
2.3.3.12 Miscellaneous Gas System
2.3.3.13 Plant Sample System
2.3.3.14 Primary Containment Ventilation System
2.3.3.15 Radiation Monitoring System
2.3.3.16 Spent Fuel Pool Cooling System
2.3.3.17 Station and Instrument Air System
2.3.3.18 Steam Exclusion System
2.3.3.19 Turbine and Administration Building Ventilation System
2.3.3.20 Waste Disposal System
2.3.3.21 Water Treatment System

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

<u>Auxiliary Systems Generic Requests for Additional Information</u>. 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.

In RAI 2.3-01, dated November 19, 2008, the staff noted drawings for which drawing numbers and/or locations for the continuations could not be identified, or could not be located where identified. The applicant was requested to provide the drawing continuation locations.

In its December 18, 2008 response, the applicant provided the continuation locations. However, for LRA Section 2.3.3.17 the applicant stated that the boundaries extend up to and include normally closed isolation valves or installed end devices providing a pressure boundary for the system, but did not provide continuations.

The staff requested that an NRC Inspection Team conduct an inspection to verify the applicant's response for selected LRA Section 2.3.3.17 lines. The Inspection Team verified the applicant's response and that all component types within the license renewal boundary are subject to AMR for the selected lines. The full description of this inspection is documented in NRC Inspection Report 05000282/2009006 and 05000306/2009006 dated March 27, 2009.

For LRA sections 2.3.4.5 and 2.3.4.6, the staff located the drawing continuations from the applicant's response; however, several differences in the license renewal scoping criteria between the main drawing and continuation drawings were noted. In a February 26, 2009 letter, the applicant satisfactorily responded to these staff followup questions by clarifying which license renewal scoping criteria was correct.

Based on its review, the staff finds the applicant's response to RAI 2.3-01 acceptable because the applicant provided the continuation locations and clarified which license renewal scoping criteria was correct. An NRC Inspection Team confirmed for those lines where a continuation was not provided that all component types within the license renewal boundary are identified and subject to an AMR. Therefore, the staff's concern described in RAI 2.3-01 is resolved.

In RAI 2.3-02, dated November 19, 2008, the staff noted that during the scoping and screening review process the continuation from one drawing to another was potentially identified, but not definitively established. Accordingly, the staff made certain assumptions regarding continuation from one drawing to another. The staff asked the applicant to confirm the staff assumptions.

In its response, dated December 18, 2008, the applicant provided confirmation that all of the staff assumed continuation locations were correct.

Based on its review, the staff finds the applicant's response to RAI 2.3-02 acceptable because the applicant confirmed the staff assumed drawing continuations were correct. Therefore, the staff's concern described in RAI 2.3-02 is resolved.

In RAI 2.3-03, dated November 19, 2008, the staff noted drawings that show a continuation without the submission of the continuation drawing. The staff asked the applicant to provide the continuation drawings or a corrected continuation.

In its response, dated December 18, 2008, the applicant provided corrected continuation locations. However, for LRA Section 2.3.3.17 the applicant stated that the boundaries extend up to and include normally closed isolation valves or installed end devices providing a pressure boundary for the system. The applicant, however, did not provide continuations.

The staff requested that an NRC Inspection Team conduct an inspection to verify the applicant's response for selected LRA Section 2.3.3.17 lines. The Inspection Team verified the applicant's response and that all component types within the license renewal boundary are identified and subject to an AMR. The full description of this inspection is documented in Inspection Report 05000282/2009006 and 05000306/2009006, dated March 27, 2009.

Based on its review, the staff finds the applicant's response to RAI 2.3-03 acceptable because the applicant provided the continuation locations. An NRC Inspection Team, confirmed for those lines where a continuation was not provided, that all component types within the license renewal boundary are identified and subject to an AMR. Therefore, the staff's concern described in RAI 2.3-03 is resolved.

2.3.3.1 Auxiliary and Radwaste Area Ventilation System

2.3.3.1.1 Summary of Technical Information in the Application

LRA Section 2.3.3.1 describes the auxiliary and radwaste area ventilation (ZA) system. The ZA system includes several subsystems. The auxiliary building special ventilation (Category 1 ventilation zone) subsystem is an auxiliary system designed to reliably collect significant portions of any potential containment system leakage that might bypass the shield building annulus or leakage from systems that could recirculate primary coolant during LOCA mitigation, and to cause it to pass through particulate, high efficiency particulate air (HEPA) filters, and charcoal adsorbers before reaching the environment. Several other ventilation subsystems are also provided to exhaust air through activated charcoal beds and HEPA filters from areas subject to possible radioactive contamination. The ZA system also includes the auxiliary building normal ventilation, the hot lab/sample room ventilation, filter room ventilation, laundry room exhaust, and the radwaste and resin disposal building ventilation subsystems. In LRA Table 2.3.3-1, the applicant identifies ZA system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.1, UFSAR Sections 1.3.9, 9.1.1, 10.3.2, and the license 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 2.3.3.1-01 and 2.3.3.1-02, dated December 16, 2008, the staff noted instances where boundary drawings as within the scope of license renewal, portions of ductwork that are connected to branch ductwork that is not shown to be within the scope of license renewal on the continuation boundary drawings. The staff asked the applicant was requested to provide additional information clarifying why the branch ducts are not within the scope of license renewal.

In its response, dated January 15, 2009, the applicant stated that the ductwork referenced in the RAIs was within the scope of license renewal. The applicant also provided clarification that as an alternative to specifically identifying a seismic anchor or series of equivalent anchors, a bounding approach was used that included enough nonsafety-related ducting to ensure that these anchors are included and thereby ensure the ducting- and anchor-intended functions are maintained. The applicant did not submit revised boundary drawings to reflect the ductwork being within the scope of licensing renewal.

The staff reviewed the applicant's response. The staff finds the applicant's response to these RAIs acceptable because the applicant clarified that the ducting in question was within the scope of license renewal. Therefore, the staff's concerns described in RAIs 2.3.3.1-1 and 2.3.3.1-2 are resolved.

In RAIs 2.3.3.1-03, 2.3.3.1-04, and 2.3.3.1-05, dated December 16, 2008, the staff noted sections of ductwork that were shown as out-of-scope, while dampers mounted in the ductwork were shown as in-scope of license renewal on the boundary drawings. The staff asked the applicant to provide clarification.

In its response, dated January 15, 2009, the applicant stated that while not explicitly shown on the drawings, the Category 1 ventilation zone boundary breaks are coincident with wall penetrations with the fire damper located within the wall penetration. The boundary drawings are correct as shown.

The staff reviewed the applicant's response. The staff finds the applicant's response acceptable based on the clarification that the Category 1 ventilation zone boundary breaks are at a structural penetration and the in-scope damper is located within the penetration. Therefore, the staff's concerns described in RAIs 2.3.3.1-03, 2.3.3.1-04, and 2.3.3.1-05, are resolved.

In RAI 2.3.3.1-06 dated December 16, 2009, the staff noted that dampers located at the inlet to Unit 1 and Unit 2 auxiliary building makeup air units were shown as in-scope of license renewal, while the makeup air unit housings were not. The staff asked the applicant to provide clarification.

In its response, dated January 15, 2009, the applicant stated drawing LR-39600 incorrectly marked the dampers in question. The applicant stated inlet dampers to the makeup air units are not within the scope of license renewal and that for the 11, 12, 21, and 22 auxiliary building makeup air units and the duct between the dampers are correctly shown as not within the scope of license renewal.

The staff reviewed the applicant's response. The staff finds the applicant's response acceptable based on the clarification that the inlet dampers are not within the scope of license renewal. Therefore, the staff's concerns described in RAIs 2.3.3.1-06, is resolved.

In RAI 2.3-1 dated December 16, 2008, the staff asked a generic question: whether any fan housings on vaneaxial or propeller-style fans are credited as missile barriers and, if so, whether they should be considered in-scope of license renewal.

In its response, dated January 15, 2009, the applicant stated that the plant's current licensing basis does not credit vaneaxial or propeller fan housings as barriers for fan blade missiles.

The staff reviewed the applicant's response to RAI 2.3-1. The staff finds the applicant's response acceptable based on the clarification that the plant's current licensing basis does not credit vaneaxial or propeller fan housings as barriers for fan blade missiles. Therefore, the staff's concerns described in RAIs 2.3.-1 is resolved.

2.3.3.1.3 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 auxiliary and radwaste area ventilation 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 auxiliary and radwaste area ventilation system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.2 Chemical and Volume Control System

2.3.3.2.1 Summary of Technical Information in the Application

LRA Section 2.3.3.2 describes the chemical and volume control (VC) system. The VC system is a support system for the RCS during all normal modes of plant operation. It provides boric acid injection, chemical additions for corrosion control, reactor coolant cleanup and degasification. It also provides reactor coolant makeup, reprocessing of water letdown from the RCS, and reactor coolant pump seal water injection. It includes the boron recycle and reactor makeup subsystems. The VC system for each unit consists of one volume control tank, three charging pumps, letdown and excess letdown heat exchangers, seal water heat exchanger, regenerative heat exchanger, letdown orifices, demineralizers, filters, piping, valves, and instrumentation. In LRA Table 2.3.3-2, the applicant identifies VC system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.2, UFSAR Sections 4.4.2.2, 10.1, 10.2.3, and 14.5.4.5, and the license 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 2.3.3.2-01, dated November 19, 2008, the staff noted drawings LR-XH-1001-5 and LR-XH-1-39, location E-5, show three 10 CFR 54.4(a)(1) 3/4-inch drain lines from the seal water heat exchangers to valves 2VC-29-1, 2VC-29-2, 2VC-29-3, and VC-29-1, VC-29-2, VC-29-3 in-scope for license renewal for 10 CFR 54.4(a)(1). Piping downstream of these valves is within the scope for license renewal for 10 CFR 54.4(a)(2). A QA type designation is not provided to justify the 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2) boundaries. These three drain lines combine and continue to LR-39248 (D-8) and (D-5). A seismic anchor or seismic endpoint could not be located between the sump tank #121 and valves 2VC-29-1, 2VC-29-2, 2VC-29-3, and VC-29-1, VC-29-2, VC-29-3. The staff asked the applicant to confirm that a QA type boundary exists downstream of valves 2VC-29-1, 2VC-29-2, 2VC-29-3, and VC-29-1, VC-29-2, VC-29-3 and to justify not including a seismic anchor downstream of valves 2VC-29-1, 2VC-29-2, 2VC-29-3, and VC-29-1, VC-29-2, VC-29-3 and before sump tank #121.

In its response, dated December 18, 2008, the applicant stated a QA type boundary does exist at the above noted valve locations and that seismic anchors should be shown on drawing LR-39248, locations D-5 and D-8, where the lines are depicted passing through the mezzanine floor at elevation 715 feet.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-01 acceptable because the applicant clarified that a QA boundary does exist at the noted locations and that seismic anchors are at the mezzanine floor. Therefore, the staff's concern described in RAI 2.3.3.2-01 is resolved.

In RAI 2.3.3.2-02, dated November 19, 2008, the staff noted drawings LR-XH-1001-5 and LR-XH-1-39, location E-6, show 10 CFR 54.4(a)(1) 2-2-VC-183 and 2-VC-186 drain lines from the volume control tank (VCT) respectively to valves 2VC-11-60, and VC-11-60 in-scope for 10 CFR 54.4(a)(1). Piping downstream of these valves is in-scope for 10 CFR 54.4(a)(2). A QA type designation was not provided. These drain lines continue to drawing LR-39248, locations E-8 and E-5. A seismic anchor or seismic endpoint could not be located between the sump tank #121 and pipe sections 2-2-VC-183 and 2-VC-186. The staff asked the applicant to confirm that a QA type boundary exists downstream of valves 2VC-11-60 and VC-11-60 and to justify not including a seismic anchor downstream of pipe sections 2VC-11-60, and VC-11-60 and before sump tank #121.

In its response, dated December 18, 2008, the applicant stated that a quality assurance (QA) type boundary does exist at the above noted valve locations and that a seismic anchor should be shown on drawing LR-39248, location G-7, upstream of valve WL-51-1, where the drawing currently depicts a wall.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-02 acceptable because the applicant clarified that a QA boundary does exist at the noted locations and that seismic anchors are at a wall penetration. Therefore, the staff's concern described in RAI 2.3.3.2-02 is resolved.

In RAI 2.3.3.2-03, dated November 19, 2008, the staff noted drawing LR-XH-1-40, locations D-2, D-4, and D-5, show 10 CFR 54.4(a)(1) drain lines from the holdup tanks to valves 2VC-11-68, (no valve numbers located from tanks 11 and 121). Downstream of these valves is in-scope for 10 CFR 54.4(a)(2). A seismic anchor or seismic endpoint could not be located downstream of valve 2VC-11-68. The staff asked the applicant to provide why it not include seismic anchor downstream of the holdup tank drain valves 2VC-11-68 and those without valve numbers from tanks 11 and 121.

In its response, dated December 18, 2008, the applicant stated a QA type boundary should be shown on the downstream side of the drain valves and that a seismic anchor should be shown on drawing LR-39248, location G-7, upstream of valve WL-51-1, where the drawing currently depicts a wall.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-03 acceptable because the applicant clarified that a QA boundary does exist at the noted locations and described the location of the seismic anchor. Therefore, the staff's concern described in RAI 2.3.3.2-03 is resolved.

In RAI 2.3.3.2-04, dated November 19, 2008, the staff noted that drawing LR-XH-1001-4, location E-7, shows pipe section ¾-CS-151R (at Seal 3) from RCP Loop A that is not in-scope for license renewal. The staff asked the applicant pipe it did not include pipe section ¾-CS-151R from RCP Loop A in-scope for license renewal.

In its response, dated December 18, 2008, the applicant stated the subject line should have been shown as within the scope of license renewal for 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-04 acceptable because the applicant stated line ¾-CS-151R is within the scope of license renewal for 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.3.2-04 is resolved.

In RAI 2.3.3.2-05, dated November 19, 2008, the staff noted on drawing LR-XH-1-41 from valves VC-11-120 and 2VC-11-120 through the boric acid transfer pumps and tanks and to the RWST are within the scope for license renewal for 10 CFR 54.4(a)(2). These lines are safety-related as QA Class 1B. The staff asked the applicant why it did not include these components in-scope for 10 CFR 54.4(a)(1).

In its response, dated December 18, 2008, the applicant stated the boric acid storage tanks and associated components are safety-related based on plant preference. License Amendments 156/147 dated April 16, 2001, removed the boric acid storage tanks (BASTs) from the Technical Specifications for the safety injection system. Therefore the BASTs are not required to accomplish the functions described in 10 CFR 54.4(a)(1) and are not within the scope of license renewal for 10 CFR 54.4(a)(1).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-05 acceptable because the applicant stated the boric acid storage tanks and associated components are designated as safety-related based on plant preference and are no longer required to support a safety-related function; thus, they are not within the scope of license renewal for 10 CFR 54.4(a)(1). The staff confirmed this by reviewing the safety evaluation report issued with License Amendments 156 and 147. Therefore, the staff's concern described in RAI 2.3.3.2-05 is resolved.

2.3.3.2.3 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 VC 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 VC system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.3 Component Cooling Water System

2.3.3.3.1 Summary of Technical Information in the Application

LRA Section 2.3.3.3 describes the component cooling (CC) system. The CC system is an auxiliary system that is designed to provide heat removal from safeguards equipment associated with heat removal from the RCS during and following DBEs and provide heat removal from safeguards and nonsafeguards equipment during normal conditions. The CC system is an operating system. The CC system for each PINGP unit consists of two heat exchangers, two pumps, surge tank and necessary piping, valves, and instrumentation designed to provide two interconnected cooling loops. In LRA Table 2.3.3-3, the applicant identifies CC system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.3, UFSAR Section 10.4.2, and the license 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 2.3.3.3-01, dated November 19, 2008, the staff noted that restricting orifices located at license renewal drawing locations G-2, D-1, E-8, and D-11 on LR-39245-1 and B-8, E-8, B-1, and E-1 on drawing LR-39246-1 are in-scope for license renewal criterion 10 CFR 54.4(a)(1). In addition to the intended function of maintaining the pressure boundary, restricting orifices can also provide the intended function of flow restriction. The applicant was requested to provide additional information to explain why LRA Table 2.3.3-3 does not provide the intended function of flow restriction for restricting orifices.

In its response, dated December 18, 2008, the applicant stated in addition to a pressure boundary function, the restricting orifices have a "throttle" function for flow indication and alarm. However, for these orifices, the "throttle" function is not an intended function and, therefore is not included in Table 2.3.3-3.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.3-01 acceptable because the applicant clarified that for these restricting orifices, the throttle function (i.e. flow indication and alarm) is not an intended function. Therefore, the staff's concern described in RAI 2.3.3.3-01 is resolved.

In RAI 2.3.3.3-02, dated November 19, 2008, the staff noted that drawing LR-39245-2, location C-1, shows a 3-CC-9 pipeline that is in-scope for criterion 10 CFR 54.4(a)(1) that has a continuation note stating "From Unit 1 Component Cooling Heat Exchanger See LR-39245-1." Drawing LR-39245-1, location F-7, also shows a 3-CC-9 pipeline that is in-scope for criterion 10 CFR 54.4(a)(1) that has a continuation note stating "To #11 Seal Water Heat Exchanger See LR-39245-2." The staff asked the applicant to explain why there are two 3-CC-9 pipelines.

In its response, dated December 18, 2008, the applicant stated that the line number 3-CC-9 shown on Drawing LR-39245-1, location F-7, should be 3-CC-35 and provided the correct drawing continuation locations.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.3-02 acceptable because the applicant clarified that there is only one 3-CC-9 pipeline and provided the corrected pipeline number and drawing continuations. Therefore, the staff's concern described in RAI 2.3.3.3-02 is resolved.

2.3.3.3.3 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 that the applicant has appropriately identified the CC 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 CC system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.4 Containment Hydrogen Control System

2.3.3.4.1 Summary of Technical Information in the Application

LRA Section 2.3.3.4 describes the containment hydrogen control (HC) system. The HC system is an auxiliary system designed to provide a sampling path from the primary containment to a hydrogen analyzer and provide a method to reduce the containment pressure during normal conditions. The HC system is a standby system. The HC system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the HC system potentially could prevent the satisfactory accomplishment of a safety-related function. In LRA Table 2.3.3-4, the applicant identifies HC system component types it believes are 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 5.4.2, 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 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 2.3.3.4-01 dated December 16, 2008, the staff noted instances where boundary drawings identified control valves as being within the scope of license renewal but the pneumatic tubing of the valve positioner connected to the valve was not shown to be within the scope of license renewal. The staff asked the applicant to verify that the boundary drawings were correct or to provide justification why the positioner's tubing was not in-scope for license renewal.

In its response, dated January 15, 2009, the applicant stated the instrument air piping referenced in the RAIs was within the scope of license renewal. The applicant also provided clarification that for drawing clarity, station and instrument air (SA) system boundary breaks were generally not shown at the individual components. The applicant stated that the SA piping is evaluated in LRA Section 2.3.3.17.

The staff reviewed the applicant's response to RAI 2.3.3.4-01 and finds it acceptable because the applicant stated that the SA piping referenced in the RAI is within the scope of license renewal and is evaluated in LRA Section 2.3.3.17.

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 HC 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 HC system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.5 Control Room and Miscellaneous Area Ventilation System

2.3.3.5.1 Summary of Technical Information in the Application

LRA Section 2.3.3.5 describes the control room and miscellaneous area ventilation (ZN) system. The ZN system is an auxiliary system designed to provide a reliable means of cooling and filtering air supplied to the control room under both normal conditions and during and following DBEs, and includes the control room breathing air subsystem. The ZN system also includes the safeguards chilled water and the lab and service area air conditioning and chilled-water subsystems designed to remove heat from safeguards and non-safeguards areas, the battery room special exhaust ventilation subsystem designed to prevent the buildup of a combustible concentration of hydrogen gas in the battery rooms, and the service and computer ventilation subsystem designed to provide heat removal from the service building and the computer room. The ZN system and subsystems are operating systems. In LRA Table 2.3.3-5, the applicant identifies ZN system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.5, UFSAR Sections 2.9.4, 8.5.6, 10.3.3, and the license 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 2.3.3.5-01 and 2.3.3.5-04 dated December 16, 2008, the staff noted instances where boundary drawings identified portions of ductwork as within the scope of license renewal that are connected to ductwork that is not shown to be within the scope of license renewal. The staff requested the applicant to verify the boundary drawings were correct or to provide justification why the duct sections were not in-scope for license renewal.

In its response, dated January 15, 2009, the applicant stated the ductwork referenced in the RAIs was within the scope of license renewal. The applicant also provided clarification that as an alternative to specifically identifying a seismic anchor or series of equivalent anchors, a bounding approach was used that included enough nonsafety-related ducting to ensure these anchors are included and thereby ensure the ducting and anchor intended functions are maintained.

In RAI 2.3.3.5-02 dated December 16, 2008, the staff noted that in LR Drawing LR39603-1, the applicant marked a fire damper as not within the scope of license renewal, but marked the ductwork on either side of it as in scope. The staff asked the applicant to explain why it did not consider the fire damper to be in scope for license renewal.

In its response, dated January 15, 2009, the applicant stated that the damper was incorrect and that the fire damper was is in-scope of license renewal.

The staff reviewed the applicant's responses for RAIs 2.3.3.5-01, 2.3.3.5-02, and 2.3.3.5-04. The staff finds the applicant's response acceptable based on the clarification that the ductwork and damper in question are in-scope for license renewal. Therefore, the staff's concerns described in RAIs 2.3.3.5-01, 2.3.3.5-02, and 2.3.3.5-04 have been addressed.

In RAI 2.3.3.5-03 dated December 16, 2008, the staff asked the applicant to clarify whether the control room ventilation equipment is within the same protected ventilation zone as the control room and, specifically, whether there are any condensate drains on the air handling units that would be considered to be in scope as barriers to prevent the units from drawing in contaminated air.

In its response, dated January 15, 2009, the applicant identified the continuation drawings for the condensate drawings. The applicant indicated that the drawings incorrectly classified the condensate drains as in-scope under 10 CFR 54.4(a)(1) and that they are actually in-scope under 10 CFR54.4 (a)(2).

The staff reviewed the applicant's response. The applicant considered the equipment drains and any water traps (if installed) in the drain as a potential source of unfiltered in-leakage into the control room envelope. The applicant also considered the spatial interactions between the air-handling units and the floor due to the equipment drains. The applicant's response is acceptable.

In RAIs 2.3.3.5-05, 2.3.3.5-06, and 2.3.3.5-07 dated December 16, 2008, the staff noted that fan housings were classified as out-of-scope, but that adjacent ductwork and cooling coils were classified as in scope under 10 CFR 54.4(a)(2). The staff asked the applicant to confirm that the fan housing were not in-scope and to justify that determination.

In its response, dated January 15, 2009, the applicant stated the fan housings are correctly identified as not in-scope of license renewal. The applicant explained that the adjacent ductwork and cooling coils are in-scope for license renewal to ensure that the structural support and integrity of the safety-related steam exclusions dampers is maintained.

The staff reviewed the applicant's response for RAIs 2.3.3.5-05, 2.3.3.5-06, and 2.3.3.5-07 and finds it acceptable. Because the adjacent ductwork and cooling coils are not in-scope as pressure boundaries, the staff's concern that the fan housing may be in scope as pressure boundaries has been resolved.

2.3.3.5.3 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 that the applicant has appropriately identified the ZN system mechanical components as being within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the ZN system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.6 Cooling Water System

2.3.3.6.1 Summary of Technical Information in the Application

LRA Section 2.3.3.6 describes the cooling water (CL) system. The CL system is an auxiliary system that is designed to provide a water supply to the auxiliary feedwater pumps for RCS heat removal and provides a water supply for safeguards and non-safeguards equipment heat loads during normal conditions and during and following DBEs. The CL system also provides a normal or backup source of water to various plant equipment, including the fire protection headers. The CL system includes the filtered water, hypobromus acid feed, equipment heat removal, and the containment and auxiliary building cooling subsystems. The CL system is an operating system. The CL system consists of five pumps feeding a ring header that distributes cooling water throughout the plant and includes filters, heat exchangers, chillers, cooling coils and the necessary piping, valves and instrumentation. In LRA Table 2.3.3-6, the applicant identifies CL system component types it believes are 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 1.3.9, 6.2.2.1.3, 10.1, 10.3.1.2.1, and 10.4.1, and the license 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 2.3.3.6-01 dated November 19, 2008, the staff noted that license renewal drawing LR-86172-4, locations B-4 and B-8, show the inlet and outlet piping to the CRDM heat exchangers within the scope of license removal per 10 CFR 54.4(a)(2); however, CRDM cooling coil assemblies 117-141 and 217-141 are shown as not within the scope of license renewal. The staff asked the applicant to explain why the CRDM cooling coil assemblies are not within the scope of license renewal per 10 CFR 54.4(a).

In its response, dated December 18, 2008, the applicant stated that the CRDM cooling coil assemblies are within the scope of license renewal. The un-highlighted box containing the assembly description should be highlighted as within the scope of license renewal per 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-01 acceptable because the applicant clarified that the un-highlighted box containing the assembly description should be highlighted as within the scope of license renewal per 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.3.6-01 is resolved.

In RAI 2.3.3.6-02, dated November 19, 2008, the staff noted license renewal drawing LR-86172-4, location D-3, shows #13 Fan Coil Unit (FCU) for Unit 1 within the scope of license renewal per 10 CFR 54.4(a)(1). LR-86172-4, location D-2, shows FCU (#14) as not within the scope of license renewal. The staff asked the applicant to explain why #14 FCU is not within the scope of license renewal per 10 CFR 54.4(a).

In its response, dated December 18, 2008, the applicant stated the highlighting of #14 FCU is incorrect and should be highlighted as within the scope of license renewal per 10 CFR 54.4(a)(1).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-02 acceptable because the applicant clarified the #14 FCU is within the scope of license renewal per 10 CFR 54.4(a)(1). Therefore, the staff's concern described in RAI 2.3.3.6-02 is resolved.

In RAI 2.3.3.6-03, dated November 19, 2008, the staff noted drawings LR-39216-2, location D-2, and LR-39217-1, location C11, show portions of 30-inch standpipes as within the scope of license renewal per 10 CFR 54.4(a)(2) and portions within the scope of license renewal per 10 CFR 54.4(a)(3). The transition from 10 CFR 54.4(a)(2) to 10 CFR 54.4(a)(3) criteria occurs in the middle of the pipe. The staff asked the applicant to clarify the criteria for being within the scope of license renewal for these standpipes or explain why portions of this piping have different criteria.

In its response, dated December 18, 2008, the applicant stated that the highlighting of the 30-inch standpipes is incorrect. The standpipe 10 CFR 54.4(a)(3) scoping boundary should extend to the downstream flange of valves CL-34-1 and 2CL-34-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-03 acceptable because the applicant clarified that the standpipes 10 CFR 54.4(a)(3) license renewal boundary extends to the downstream flange of valves CL-34-1 and 2CL-34-1. Therefore, the staff's concern described in RAI 2.3.3.6-03 is resolved.

In RAI 2.3.3.6-04, dated November 19, 2008, the staff noted drawing LR-39223, location A-7, shows pipe section 2-CL-112 (after valve AF-25-6) as in-scope for license renewal per 10 CFR 54.4(a)(3) or 10 CFR 54.4(a)(1). However, portions of the same pipe section (2-CL-112) before valve AF-25-6 and after the grid location A-5 are included in-scope for license renewal per 10

CFR 54.4(a)(2). The staff noted similar line 2-CL-111 on LR-39222 is in-scope for 10 CFR 54.4(a)(2). The staff asked the applicant to provide additional information explaining why the different criterion was used for this pipe section (2-CL-112).

In its response, dated December 18, 2008, the applicant stated on drawing LR-39223, location A-7, line 2-CL-112 between valve 2AF-25-6 and grid location A-5 is incorrectly highlighted and should be highlighted as within the scope of license renewal per 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-04 acceptable because the applicant stated that pipe section 2-CL-112 is in-scope per 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.3.6-04 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 CL 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 CL system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.7 Diesel Generator and Screenhouse Ventilation System

2.3.3.7.1 Summary of Technical Information in the Application

LRA Section 2.3.3.7 describes the diesel generator and screenhouse ventilation (ZG) system. The D1/D2 diesel generator room ventilation, D5/D6 building HVAC and the screenhouse ventilation subsystems are designed to limit ambient temperature within equipment ratings when the associated diesel generators are operating. Portions of these subsystems provide fresh air and remove exhaust air to provide a suitable working environment, prevent the buildup of flammable atmosphere in certain rooms, and maintain temperatures required by machinery during normal plant operation. In LRA Table 2.3.3-7, the applicant identifies ZG system component types it believes are 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 Sections 8.4.1, 8.4.2, 10.3.12, and the license 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 RAI as discussed below.

In RAI 2.3.3.7-01 dated December 16, 2008, the staff noted an instance where the description in LRA Section 2.3.3.7 seemed to differ from what was indicated as in-scope on the boundary drawings. The staff requested clarification why the exhaust fan housings were not shown as in-scope for license renewal.

In its response, dated January 15, 2009, the applicant stated that only the diesel generator (room) exhaust fans are in-scope. The diesel outside exhaust fans are not relied upon during DBEs and do not perform a function necessary to the satisfactory accomplishment of a safety-related intended function.

The staff reviewed the applicant's response to RAI 2.3.3.7-01. The staff finds the applicant's response satisfactory because the applicant clarified that only the diesel generator (room) exhaust fans are in-scope because the diesel outside exhaust fans are not relied upon during DBEs and do not perform a safety-related intended function. Therefore, the staff's concern described in RAI 2.3.3.2-03 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 ZG 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 ZG system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.8 Diesel Generators and Support System

2.3.3.8.1 Summary of Technical Information in the Application

LRA Section 2.3.3.8 describes the diesel generator and support (DG) System. The DG System is an auxiliary system that is designed to provide backup power to safety-related, nonsafety-related and security equipment. In addition, the system includes diesel motors that provide the motive force for the cooling water pumps. The DG system includes the safety-related diesel generators, nonsafety-related diesel generators, guardhouse diesel generator and cooling water diesel driven pumps. The DG system is a standby system. The safety-related diesel generators for each PINGP Unit consist of two diesel generators, including starting air, lube oil, combustion air, exhaust air, engine cooling and fuel oil subsystems, and the necessary piping, valves and instrumentation. In LRA Table 2.3.3-8, the applicant identifies DG system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.8.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.8; UFSAR Sections 8.4.1, 8.4.2, 8.4.5, 10,4.1.2, and Tables 8.4-3, and 8.4-4 and the license 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 2.3.3.8-01, dated November 19, 2008, the staff noted that drawings LR-11824, LR-118243, LR-118244, and LR-118245, locations C-4 and C-9, show diesel engine radiators that are in-scope of license renewal based on 10 CFR 54.4(a)(1). The radiators are not shown in LRA Table 2.3.3-8 as components subject to an AMR. The staff asked the applicant to provide additional information explaining why these radiators are not included in LRA Table 2.3.3-8 as a component type subject to an AMR.

In its response, dated December 18, 2008, the applicant stated: "The D5 and D6 diesel engine radiators are evaluated as heat exchanger components and heat exchanger tubes and are included in LRA Table 2.3.3-8."

Based on its review, the staff finds the applicant's response to RAI 2.3.3.8-01 acceptable because the applicant clarified that the radiators are evaluated as heat exchanger components and heat exchanger tubes and are included in LRA Table 2.3.3-8. Therefore, the staff's concern described in RAI 2.3.3.8-01 is resolved.

In RAI 2.3.3.8-02, dated November 19, 2008, the staff noted that drawings LR-118248 and LR-118249, location B-6, show diesel fuel oil day tanks, which have flame arrestors that provide a pressure boundary that are in-scope for license renewal based on criterion 10 CFR 54.4(a)(1). The flame arrestors (flame arrestor housing for pressure boundary and flame arrestor element for flame arresting) are not shown in LRA Table 2.3.3-8 as components subject to an AMR. The staff asked the applicant was requested to provide additional information explaining why the flame arrestor housing and element are not included in LRA Table 2.3.3-8 as component types subject to an AMR.

In its response, dated December 18, 2008, the applicant stated at the point that the 2-inch vent and flame arrestor connects to the fuel oil day tank, a license renewal system boundary break between the fuel oil system and diesel generator and support system should be shown. The applicant also stated that the flame arrestors are evaluated as part of the fuel oil system, LRA Section 2.3.3.10, and are included in Table 2.3.3-10. It was also noted that these components should include the intended function of "Fire Barrier." The applicant submitted changes to LRA Table 3.3.2-10 to include the flame arrestor's internal surfaces, which had been omitted.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.8-02 acceptable because the applicant clarified that the flame arrestors are evaluated in LRA Section 2.3.3.10, Fuel Oil System, and are included as flame arrestors in Table 2.3.3-10. Changes concerning the flame arrestors were made in LRA Tables 2.3.3-10 and 3.3.2-10 and LRA Section 3.3.2.1.10. Therefore, the staff's concern described in RAI 2.3.3.8-02 is resolved.

In RAI 2.3.3.8-03, dated November 19, 2008, the staff noted that drawings LR-118250 and LR-118251, locations D-3, and D-9, show diesel starting air pipelines with oiler components in-scope for license renewal based on 10 CFR 54.4(a)(1). The oilers are not shown in LRA Table 2.3.3-8 as components subject to an AMR. The staff asked the applicant to provide additional information explaining why the oilers are not included in LRA Table 2.3.3-8 as a component type subject to an AMR.

In its response, dated December 18, 2008, the applicant stated the oilers are inline piping components, are evaluated as piping/fittings, and are included in Table 2.3.3-8.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.8-03 acceptable because the applicant clarified that the oiler components are included in LRA Table 2.3.3-8 and evaluated as piping/fittings. Therefore, the staff's concern described in RAI 2.3.3.8-03 is resolved.

In RAI 2.3.3.8-04, dated November 19, 2008, the staff noted that drawing LR-39255-1, (location D-9) shows a 2-inch vent at the top of the D-1 and D-2 fuel oil day tanks, that are in-scope for criterion 10 CFR 54.4(a)(1). The 2-inch vents at the top of the D-1 and D-2 fuel oil day tanks do not have a symbol for a vent. The symbol provided is a box, which could be a flame arrestor. The D-5 and D-6 fuel oil day tanks shown on drawings LR-118248 and LR-118249, respectively, (location B-6) are also shown in-scope for 10 CFR 54.4(a)(1) and appear to have the symbol and description for a 2-inch vent and flame arrestor. The staff asked the applicant to provide additional information that clarifies whether the symbols at the top of the D-1 and D-2 fuel oil day tanks are a 2-inch vent and flame arrestor.

In its response, dated December 18, 2008, the applicant stated the box symbol represents a T-style outlet vent with material and function similar to the other fuel oil tank vent and flash arrestor assemblies, which are evaluated as flash arrestors, and are included in Table 2.3.3-10.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.8-04 acceptable because the applicant clarified that the symbols represent flash arrestors which are evaluated in LRA Table 2.3.3-10. Therefore, the staff's concern described in RAI 2.3.3.8-04 is resolved.

2.3.3.8.3 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 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 DG system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.9 Fire Protection System

2.3.3.9.1 Summary of Technical Information in the Application

LRA Section 2.3.3.9 describes the fire protection (FP) system. The FP system is an auxiliary system designed to provide reasonable assurance, through defense-in-depth, that a fire will not prevent the performance of necessary safe shutdown functions and that radioactive releases to the environment in the event of a fire will be minimized. The FP system utilizes water spray, cardox, halon, hose stations and sprinklers to combat fire. Portable extinguishers are also provided extensively throughout the plant. The FP System includes the reactor coolant pump (RCP) lube oil collection, fire water, halon, carbon dioxide and fire detection subsystems. The fire water subsystem consists of two dedicated fire pumps, one motor-driven and one diesel-driven, filters and the necessary piping, valves and instrumentation. In LRA Table 2.3.3-9, the applicant identifies FP system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.9.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.9, UFSAR section 10.3.1, and license renewal drawings 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 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 that the applicant identified as 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 PINGP, Units 1 and 2, fire protection CLB documents listed in the PINGP, Units 1 and 2, Operating License Condition 2.C.4

The staff also reviewed PINGP, Units 1 and 2, commitments to 10 CFR 50.48, “Fire protection” (i.e., approved fire protection program), responses to Appendix A 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, documented in the PINGP, Units 1 and 2, September 6, 1979, SER.

During its review of LRA Section 2.3.3.9, the staff identified areas in which additional information was necessary to complete its review of the applicant’s scoping and screening results. The applicant responded to the staff’s RAIs as discussed below.

In RAI 2.3.3.9-1, dated November 19, 2008, the staff stated that Section 4.3.1.5 of the PINGP, Units 1 and 2, SER, dated September 6, 1979, discusses various types of wet-pipe automatic sprinkler, deluge, and pre-action dry-pipe sprinkler subsystems provided in the plant areas for fire suppression activities. The sprinkler subsystems in various areas are as follows:

Wet Pipe Automatic Sprinkler Subsystems	Area/Component
	• Turbine Building–Turbine Lube Oil and Control Oil Piping Areas • Air Compressor and Auxiliary Feedwater Pump Rooms • Exit Stairwells • Records Storage Area • Decontamination Area • Water Treatment Area • Warehouse • Hot Lab Area

Deluge Subsystems	Area/Component
	• Main Auxiliary and Startup Transformers • Turbine Seal Oil Unit • Turbine Lube Oil Reservoir • Oil Storage Room • Charcoal Filter–Auxiliary Building Special Exhaust Filter and the Shield Building Exhaust Filters

Pre-Action Sprinkler Subsystems	Area/Component
	• Turbine Generators Bearings • Containment Cable Penetration Areas • Screen House Pump Area (Both Levels) Including the Diesel Cooling Water Pumps and the Diesel Driven Fire Pump

The staff requested that the applicant verify whether the above suppression systems installed in various areas of the plant are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested that the applicant provide justification for the exclusion.

In its response, dated December 11, 2008, the applicant stated that the wet-pipe automatic sprinkler, deluge, and pre-action sprinkler subsystems installed in various areas of the plant for fire suppression are in the scope of license renewal in accordance with 10 CFR 54.4(a) and are subject to an AMR in accordance with 10 CFR 54.21(a)(1). The applicant provided the following responses:

> Wet Pipe Automatic Sprinkler Systems. The Turbine Building–Turbine Lube Oil and Control Oil Piping Areas Sprinkler subsystems are shown on Drawings LR-39228-2 and 3. See Drawing LR-39228-2, location D-7, Turbine Oil Sprinkler System WPS-18. See Drawing LR-39228-3, location G-4, Turbine Oil Pipe Wet Pipe System WPS-21.
>
> The Air Compressor and Auxiliary Feedwater Pump Rooms Sprinkler subsystem is shown on Drawing LR-39228-2, location D-3, Air Compressor and Auxiliary Feedwater Pump Area Sprinkler System WPS-10.
>
> Exit stairwells used for egress or to allow access to manual fire suppression are provided with sprinkler systems throughout the plant. Exit stairwell sprinkler systems are shown on Drawings LR-100282 and LR-39228-2, 3, 4 and 5. See Drawing LR-100282, location D-4, Stairs Wet Pipe Sprinkler System. See Drawing LR-39228-2, location E-5, Stairway Sprinkler System SWP-3 (incorrectly labeled WPS-18), location B-9, Stairway Sprinkler System SWP-5, and location

G-9, Stairway Wet Pipe System SWP-6. See Drawing LR-39228-3, location E-2, Stairway Sprinkler System SWP-14 and location H-6, Stairway Sprinkler System SWP-13. See Drawing LR-39228-4, location B-4, Stairway Sprinkler System SWP-12, location B-10, Stairway Sprinkler System SWP-4, location F-5, Stairway Sprinkler System SWP-1 and location C-6, Stairway Sprinkler System SWP-2. See Drawing LR-39228-5, location A-5, Stairwell sprinklers.

The Records Storage Area Sprinkler subsystem is shown on Drawing LR-39228-4, location G-8, Record Room System WPS-23.

The Decontamination Area at Access Control is protected by a wet pipe sprinkler subsystem shown on Drawing LR-39228-4, location A-8, Laundry Room, Toilet Room, Clothes Storage Room and Corridor Sprinkler Systems WPS-20.

The Water Treatment Area Sprinkler subsystem is shown on Drawing LR-39228-2, location E-9, Turbine Room (East Side) Sprinkler System WPS-9.

The Warehouse Sprinkler subsystems are shown on Drawing LR-39228-3. See location B-3, Warehouse Sprinkler and Hose Stations, and location F-9, Warehouse #2 Sprinkler System
DE-3.

The Hot Lab Area Sprinkler subsystem is shown on Drawing LR-39228-4, location C-6, WPS-19 Hot Chemical Laboratory.

Deluge Systems. The Main, Auxiliary, and Startup Transformers Deluge subsystems are shown on Drawings LR-39228-2 and LR-39228-3. See Drawing LR-39228-2, location B-6, B-7 and B-8, Transformer Sprinkler Systems DM-3, DM-2 and DM-1, respectively. See Drawing LR-39228-3, location D-2, D-4 and D-5, Transformer Sprinkler System DM-5, DM-4 and DM-6, respectively.
The Turbine Seal Oil Unit Deluge subsystems are shown on Drawings LR-39228-2 and LR-39228-3. See Drawing LR-39228-2, location D-9, Hydrogen Seal Oil Unit Sprinkler System DA-1. See Drawing LR-39228-3, location G-2, Hydrogen Seal Oil Sprinkler System DA-5.
The Turbine Lube Oil Reservoir Deluge subsystems are shown on Drawings LR-39228-2 and LR-39228-3. See Drawing LR-39228-2, location D-4, Turbine Oil Reservoir Area Sprinkler System DA-3. See Drawing LR-39228-3, location G-6, Turbine Oil Reservoir Sprinkler System DA-4.

The Oil Storage Room Deluge subsystem is shown on Drawing LR-39228-2, location B-3, Turbine Oil Storage Room Sprinkler System DA-2.

The Charcoal Filter – Auxiliary Building Special Exhaust Filter and the Shield Building Exhaust Filters Deluge subsystems are shown on Drawing LR-39603-4, location C-4 through E-4 and location E-11 through G-11.

Pre-Action Sprinkler Systems. The Turbine Generator Bearing Pre-Action subsystems are shown on Drawings LR-39228-2 and LR-39228-3. See Drawing

LR-39228-2, location B-10, Turbine Bearing Fire Protection Pre-action System PA-14. See Drawing LR-39228-3, location B-11, Turbine Bearing Fire Protection Pre-action System PA-15.

The Containment Cable Penetration Area Pre-Action Sprinkler subsystems are shown on Drawing LR-39228-4, location C-3, D-5, D-8 and C-10, Electrical Penetration Pre-Action System PAD-7, PAD-6, PAD-3 and PAD-4 respectively.

The Screen House Pump Area (Both Levels) including the Diesel Cooling Water Pumps and the Diesel Driven Fire Pump Pre-Action Sprinkler subsystem is shown on Drawing LR-39228-3, location B-8, Screenhouse Sprinkler System PAD-9.

The scoping boundaries extend up to and include the installed end devices such as sprinkler heads and spray nozzles. The interconnected piping/fittings, valves, sprinkler heads, spray nozzles, and in-line components are within the scope of license renewal and subject to AMR. Piping/fittings, valves, sprinkler heads, spray nozzles and other in-line components are included in LRA Table 2.3.3-9, and AMR aging management evaluations are included in Table 3.3.2-9.

Based on the review, the staff finds the applicant's response to RAI 2.3.3.9-1 acceptable because wet-pipe automatic sprinkler, deluge, and pre-action sprinkler subsystems in question were identified to be within the scope of license renewal and subject to an AMR.

The staff has confirmed that the applicant correctly identified Wet Pipe Automatic Sprinkler Systems in Turbine Lube-Oil and Control-Oil Piping Areas, Air Compressor and Auxiliary Feedwater Pump Rooms, Exit Stairwells, Records Storage Area, Decontamination Area, Water Treatment Area, Warehouse, and Hot Lab Area; Deluge Systems in Main Auxiliary and Startup Transformers, Turbine Seal Oil Unit, Turbine Lube Oil Reservoir, Oil Storage Room, and Charcoal Filter–Auxiliary Building Special Exhaust Filter and the Shield Building Exhaust Filters; and Pre-Action Sprinkler Systems in Turbine Generators Bearings, Containment Cable Penetration Areas, and Screen House Pump Area (Both Levels), Including the Diesel Cooling Water Pumps and the Diesel Driven Fire Pump. The staff concludes that above water-based fire suppression subsystems and their associated components are correctly included in the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.9-1 is resolved.

In RAI 2.3.3.9-2, dated November 19, 2008, the staff stated that LRA Tables 2.3.3-9 and 3.3.2-9 exclude several types of fire protection components that appear on the LRA drawings as within the scope of license renewal or discussed in PINGP CLB documents. These components are listed below:

- hose connections
- interior fire hose stations
- pipe supports
- couplings
- dikes for oil spill confinement
- floor drains and curbs for fire-fighting water

- backflow prevention devices
- trash grids and traveling screens
- flame retardant coating for cables
- fire retardant intumescent coating for polyurethane foam insulation
- turbine building smoke removal system components
- air compressors for safe-shutdown operations

The staff asked the applicant to verify whether the components listed above are within scope of the license renewal in accordance with 10 CFR 54.4(a) and are subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested that the applicant provide justification for the exclusion.

In its response, dated December 11, 2008, the applicant stated the following:

> Fire protection hose connections are within the scope of license renewal. Hose connections from the plant fire header, hydrants and valves are evaluated as piping/fittings and are included in LRA Table 2.3.3-9 and Table 3.3.2-9. Fire hoses, including integral hose connections, are evaluated in LRA Section 2.1.3.2.2. Fire hoses are inspected and tested periodically and must be replaced if they do not pass the test or inspection; these components are short lived and are not subject to Aging Management Review.
>
> Interior fire hose stations are within the scope of license renewal. Interior fire hose stations components are evaluated as Piping/Fittings and Valves and are included in LRA Table 2.3.3-9 and Table 3.3.2-9.
>
> Pipe supports for fire protection piping are within the scope of license renewal. See LRA Section 2.4.2 and Table 2.4.2-1 for supports, and Section 2.3.3.9 and Table 2.3.3-9 for fire protection piping. For additional detail and for aging management of fire protection pipe supports, see Table 3.5.2-2 for the component type, "Support (...non-ASME piping...)."
>
> Fire header couplings are within the scope of license renewal. Fire header couplings are evaluated as piping/fittings and are included in LRA Table 2.3.3-9 and Table 3.3.2-9.
>
> Dikes for oil spill confinement are addressed by the component types, "Concrete (curbs, walls, slabs)" and "Steel components (angles used to contain fuel oil leaks)." These component types, as used in the PINGP LRA, include structures that provide intended functions to direct flow and/or provide a fire barrier to prevent the spread of flammable liquids. These components are in-scope of license renewal and protect safety-related structures and safe shutdown systems from fire damage. Concrete floor depressions, part of the concrete slab design, are also used to direct the flow of flammable liquids. These components are located throughout safety-related structures and can be found in LRA Tables 2.4.1-1, 2.4.4-1, 2.4.5-1, and 2.4.9-1. For aging management of these concrete and steel components, see LRA Tables 3.5.2-1, 3.5.2-4, 3.5.2-5, and 3.5.2-9.

There is a reinforced concrete wall surrounding the fuel oil receiving tank located outside, adjacent to the south wall of the D5/D6 Diesel Generator Building. However the wall is not in-scope of license renewal. Since the tank performs a support function and not a confinement function, it is not in-scope of license renewal.

Floor drains for fire fighting water are within the scope of license renewal and are evaluated in the Waste Disposal (WD) System. In general, floor drains are highlighted as within the scope of license renewal per 10 CFR 54.4(a)(2) due to flooding and/or spatial interaction intended functions. Where they may also have an 10 CFR 54.4(a)(3) function, this was not differentiated (for example, see Drawing LR-39248). The Turbine Oil Reservoir and Oil Storage Room drains are specifically discussed in Section 4.5 of the Safety Evaluation Report dated September 9, 1979. These drains are depicted on Drawings LR-39231-1, locations G-3 and H-8, and LR-39231-2, location H-4; and should be highlighted as within the scope of license renewal per 10 CFR 54.4(a)(3). Floor drains are evaluated as Piping/Fittings and are included in LRA Table 2.3.3-20 and Table 3.3.2-20. The following changes are required to the LRA:

In LRA Section 2.3.3.20 under System Function Listing, the following function is added:

Code WD-FP	Cri 1	Cri 2	Cri 3				
Contains SCs relied upon in safety analysis or plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.48, Fire Protection.			FP	EQ	PTS	AT	SB
			X				

Comment: This system contains floor drains for fire fighting water and oil confinement, such as the Turbine Oil Reservoir and Oil Storage Room drains, that support a fire protection function.

In LRA Section 2.3.3.20 on Page 2.3-109, second paragraph, second sentence, “plant floor drains,” is added to the list of drains that comprise the Waste Liquid sub-system.

In LRA Section 2.3.3.20, Page 2.3-110, the third sentence of the fifth paragraph is revised to read as follows: “Portions of the WD System support Fire Protection or Station Blackout event requirements based on the criteria of 10 CFR 54.4(a)(3).”

Curbs for fire fighting water are addressed by the component types, “Concrete (... walls, slabs and curbs...),” “Stainless steel components (... curbs and flow deflectors...),” and “Steel components (...curbs...).” These component types as used in the PINGP LRA include structures that provide an intended function to direct flow away from safety-related equipment in order to prevent water damage. These components are in-scope of license renewal, and are located throughout safety-related structures. They are included in LRA Tables 2.4.1-1, 2.4.4-1, 2.4.7-1, and 2.4.9-1. For aging management of these concrete, stainless steel, and steel components, see LRA Tables 3.5.2-1, 3.5.2-4, 3.5.2-7, and 3.5.2-9.

The PINGP Fire Protection (FP) System is supplied from the Mississippi River and does not include connections from potable water sources. Therefore, the PINGP FP system does not contain backflow prevention devices; as a result they are not included in LRA Table 2.3.3-9 and Table 3.3.2-9. The FP system does include check valves; these are included in LRA Table 2.3.3-9 and Table 3.3.2-9.

Trash grids and traveling screens are addressed in LRA Section 2.3.4.3, Circulating Water (CW) System. The FP pumps draw water from behind the plant screenhouse trash grids and screens. During emergency operation, when the circulating water pumps are not in-service, the flows through the trash grids and screens would be insignificant and plugging or failure of the grids and screens is not credible. Therefore, trash grids and traveling screens are not relied upon to perform or support a License Renewal Fire Protection-related Intended Function.

Flame retardant coatings for cables used in penetration seals and used for cable encapsulation are in-scope of license renewal. They are included in LRA Table 2.4.5-1. For additional detail and for aging management of flame retardant coating for cables, see LRA Table 3.5.2-5 for the component types, “Fire barrier penetration seals” and “Fireproofing” for cable and cable tray.

Fire retardant intumescent coatings were originally used on all polyurethane foam piping insulation in areas containing safety-related equipment. However, the intumescent coating performed unsatisfactorily and was replaced with materials identified as Armaflex (primer) and Flammastic (mastic sealant), which have better flame spread and smoke-density test results when compared to the intumescent coating. This was conveyed in a letter to the NRC dated May 4, 1992. The NRC approved the replacement materials in a letter dated January 14, 1993. These components are in-scope of license renewal, and are identified in Table 2.4.5-1 of the LRA as, “Fire barrier penetration seals” and “Fireproofing” components. LRA Table 3.5.2-5 provides additional information on these component types and materials.

Turbine building roof exhaust fans, as well as smoke hatches that are fitted with automatic releases, are within the scope of license renewal. The turbine building roof exhaust fans are evaluated in LRA Section 2.3.3.19, Turbine and Administration Building (ZB) System (see Function ZB-FP) and are shown on Drawing LR-39601, location F-2, Turbine Building Roof Vent Fans. The fan and damper are integral to the fan housing and are evaluated as Fan Housings. They are included in LRA Table 2.3.3-19 and Table 3.3.2-19. The turbine building smoke hatches are evaluated in LRA Table 3.5.2-5.

Air compressors required for fire protection safe-shutdown operation are within the scope of license renewal. The station and instrument air compressors are evaluated in LRA Section 2.3.3.17, Station and Instrument Air (SA) System (see

Function SA-FP) and are shown on Drawings LR-39244 and LR-39253-3. The air compressors are active components and not subject to aging management review; as a result they are not included in LRA Table 2.3.3-17.

In reviewing the applicant's response to the RAI, the staff found that each item in the RAI was addressed and resolved satisfactorily as follows:

Although the description of the "piping/fittings and valves" line item provided in LRA Table 2.3.3-10 does not list these components specifically, the applicant states that it considers the hose connections, interior fire hose stations, and couplings, as included in LRA Table 2.3.3-9 under the component type "piping/fittings and valves," with the AMR results provided in LRA Table 3.3.2-9. Pipe supports for fire protection are included in LRA Section 2.4.2 and LRA Table 2.4.2-1 under the component type "supports," with the AMR results provided in LRA Table 3.5.2-2.

Dikes for oil spill confinement are included in the LRA Tables 2.4.1-1, 2.4.4-1, 2.4.5-1, and 2.4.9-1 under "Concrete (…curbs, wall slabs)" with the AMR results provided in LRA Tables 3.5.2-1, 3.5.2-4, 3.5.2-5, and 3.5.2-9

Floor drains for fire-fighting water are evaluated under the component type of piping/fitting as included in LRA Table 2.3.3-20 with the AMR results provided in LRA Table 3.3.2-20. Further, the applicant stated that LRA Section 2.3.3.20 on Page 2.3-109, second paragraph, second sentence, "plant floor drains," is added to the list of drains that comprise the Waste Liquid subsystem. Also LRA Section 2.3.3.20, Page 2.3-110, the third sentence of the fifth paragraph is revised to read as follows: "Portions of the WD System support Fire Protection or Station Blackout event requirements based on the criteria of 10 CFR 54.4(a)(3)."

Trash grids and travelling screens are evaluated in LRA Section 2.3.4.3, "Circulating Water (CW) System." The FP pumps draw water from behind the plant screenhouse trash grids and screen. The applicant stated that during emergency operation, the CW pumps are unavailable. The flows through the trash grids and screens would be insignificant and plugging or failure of the grids and screens is not credible. Therefore, trash grids and traveling screens are not relied upon to perform or support a license renewal fire protection-related intended function. Based on its review, the staff finds the applicant's response acceptable because it explained that the intended function supporting the fire pump suction supply is accomplished without trash grids and travelling screens. For normal and emergency operations without the CW pumps operating, a much lower volume of water flows through the traveling screens. The lower flow rates make it unlikely that debris could clog the travelling screens and prevent them from passing adequate flow. Additionally, the fire pump suction headers have their own strainers in-line, such that the loss of trash grids and travelling screens would not challenge the operation of these pumps until pumps repair or replacement of the damaged component could be performed.

Flame-retardant coatings for cables are included under components type "fire barrier penetration seals" and "fire proofing" in LRA Tables 2.4.5-1 and 3.5.2-5. Fire retardant intumescent coatings for all polyurethane foam piping was replaced with Armaflex (primer) and Flammastic (mastic sealant). These materials are included in the scope of license renewal and an AMR in Tables in LRA Tables 2.4.5-1 and 3.5.2-5 under component type "fire barrier penetration seals" and "fire proofing."

Turbine building smoke removal system components are evaluated in LRA Section 2.3.19 and are included in the LRA Tables 2.3.3-19, 3.3.2-19, and 3.5.2-5.

Air compressors for fire protection safe-shutdown operation are within the scope of license renewal. The air compressors are active components and are not subject to an AMR in accordance with 10 CFR 54.21(a)(1).

The staff concludes that the air compressors for fire protection safe-shutdown operation are correctly excluded from Table 2.3.3-17 and are not subject to an AMR.

The staff found that the applicant appropriately excluded the backflow prevention devices from the line item descriptions in the LRA because PINGP FP system does not contain backflow prevention devices since the water for the FP system at PINGP is supplied from the Mississippi River.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.9-2 acceptable because it resolved the staff's concerns regarding scoping and screening of FP system components listed in the RAI.

2.3.3.9.3 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 FP 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 FP system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.10 Fuel Oil System

2.3.3.10.1 Summary of Technical Information in the Application

LRA Section 2.3.3.10 describes the fuel oil (FO) system. The FO system is an auxiliary system designed to receive and store diesel fuel oil and deliver it to both safety- and nonsafety-related components consisting of diesel generators, diesel driven cooling water pumps, a heating boiler, and a diesel-driven fire pump. The FO system also provides a means of transferring fuel oil between fuel oil storage tanks and a means of filtering new and transferred oil. The FO system is a standby system. The FO system for Unit 1 consists of fuel oil storage tanks, pumps, filters and necessary piping, valves, and instruments. In LRA Table 2.3.3-10, the applicant identifies FO system component types it believes are 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 the applicant has appropriately identified the FO 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.11 Heating System

2.3.3.11.1 Summary of Technical Information in the Application

LRA Section 2.3.3.11 describes the heating (HS) system. The HS system is an auxiliary system that provides a temperate environment in the plant buildings for the protection of equipment and the comfort of personnel. In addition, the HS system provides steam for the operation of the condensate tank freeze protection heater and cleaning hose stations. The system also supplies an alternate source of steam for hoggers, air ejectors, gland sealing steam, and the water box air ejectors. The HS system includes the process steam subsystem, which is designed to provide steam to the boric acid evaporators, boric acid batching tank, and the waste evaporators. The HS system is an operating system. The HS system is shared by Units 1 and 2 and consists of a heating boiler, converters, coils, pumps, tanks, and the necessary piping, valves and instrumentation. In LRA Table 2.3.3-11, the applicant identifies HS system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.11.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.12, UFSAR Sections 10.2.3, 11.1.4, and 11.3.2, and the license 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 2.3.3.11-01, dated December 2, 2008, the staff noted drawings for which drawing numbers and/or locations for the continuations could not be identified or could not be located. The applicant was requested to provide the drawing continuation locations.

In its response dated January 16, 2009, the applicant provided the continuation locations. The applicant also identified an additional component type, flexible connections, subject to an AMR. Revision to Tables 2.3.3-11 and 3.3.2-11 were provided in the applicant's response to include the flexible connections.

Based upon its review, the staff finds the applicant's response to RAI 2.3.3.11-01 acceptable because the applicant provided the continuation locations and identified additional components subject to an AMR and provided updated tables containing the flexible connections. Therefore, the staff's concern described in RAI 2.3.3.11-01 is resolved.

In RAI 2.3.3.11-02, dated December 2, 2008, the staff noted on drawing LR-39605-1, locations C-2, D-5, G-6, and G-7, lines that appear to be vent lines with no continuation locations identified. The staff asked the applicant to confirm these lines are vent lines and identify the continuation locations.

In its response, dated January 16, 2009, the applicant clarified the purpose of the lines and identified the continuation locations. The applicant identified license renewal boundaries where they were not previously identified.

Based upon its review, the staff finds the applicant's response to RAI 2.3.3.11-02 acceptable because the applicant clarified the purpose of the lines, identified the continuation locations, and identified license renewal boundaries where not previously identified.

In RAI 2.3.3.11-03, dated December 2, 2008, the staff noted on drawing LR-39605-1, location D-2, a gauge glass on the #121 Process Steam Condensate Return Unit not in-scope for license renewal while the #121 Process Steam Condensate Return Unit is in-scope. The staff asked the applicant to include the gauge glass as in-scope in accordance with 10 CFR 54.4(a)(2) or provide justification for not including the gauge glass in-scope.

In its response, dated January 16, 2009, the applicant stated the gauge glass is in-scope for license renewal in accordance with 10 CFR 54.4(a)(2) and evaluated under the heading "sight glasses."

Based upon its review, the staff finds the applicant's response to RAI 2.3.3.11-03 acceptable because the applicant confirmed that the gauge glass is in-scope for license renewal in accordance with 10 CFR 54.4(a)(2).

In RAI 2.3.3.11-04, dated December 2, 2008, the staff noted on drawing LR-39605-3, location B-7, that valve HS-35A-1 and attached piping are not highlighted as in-scope for license renewal, but are directly connected to a 2-inch HWS line that is highlighted in-scope in accordance with 10 CFR 54.4(a)(2). The applicant was requested to provide a justification for not including valve HS-35A-1 and attached piping in-scope for license renewal.

In its response, dated January 16, 2009, the applicant stated the valve HS-35A-1 and attached piping are in-scope for license renewal.

Based upon its review, the staff finds the applicant's response to RAI 2.3.3.11-04 acceptable because the applicant stated the valve and piping are in-scope for license renewal.

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 HS mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the HS system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.12 Miscellaneous Gas System

2.3.3.12.1 Summary of Technical Information in the Application

LRA Section 2.3.3.12 describes the miscellaneous gas (CG) system. The CG system is an auxiliary system that is designed to supply gases for various plant components. The CG system consists of the nitrogen, hydrogen, and carbon dioxide subsystems. Nitrogen is supplied to purge the vapor spaces of various Nuclear Steam Supply System (NSSS) components and to pressurize the SI accumulators and VC charging pump desurgers. Hydrogen is supplied to the turbine generators, VC system volume control tanks (VCTs) and other various NSSS components. Carbon dioxide is supplied to provide a purge gas to the turbine generators and to the incore instrumentation. The CG system is an operating system. The system consists of liquid storage tanks, high pressure banks, regulators and the necessary piping, valves and instrumentation. In LRA Table 2.3.3-12, the applicant identifies CG system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.12.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.12, UFSAR Sections 9.3.2.1.4 and 9.3.2.1.5, and the license 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 2.3.3.12-01, dated November 19, 2008, the staff noted that drawing LR-39247, location C-9, shows one seismic anchor for the 1-inch nitrogen line supplying the Unit 2 containment where the line forms a T-junction. The staff asked the applicant to explain why it did not a seismic anchor downstream of the T-junction.

In its response, dated December 18, 2008, the applicant stated in part: "…a seismic endpoint should be shown on the branch line opposite the seismic anchor."

Based on its review, the staff finds the applicant's response to RAI 2.3.3.12-01 acceptable because the applicant stated that a seismic endpoint exits on the branch line opposite the seismic anchor. Therefore, the staff's concern described in RAI 2.3.3.12-01 is resolved.

In RAI 2.3.3.12-02, dated November 19, 2008, the staff noted that drawing LR-39247, locations G-2 and G-5, identifies several flexible connectors for the hydraulic desurgers as being in-scope for 10 CFR 54.4(a)(2). In addition, a note on the drawing states the boundary ends at the flexible connection. LRA Table 2.3.3.12 does not include flexible connectors as a component type requiring an AMR. The staff asked applicant to explain why it did not include flexible connectors as a component type requiring an AMR in LRA Table 2.3.3-12.

In its response, dated December 18, 2008, the applicant stated the stainless steel instrument tubing expansion loops are included in LRA Table 2.3.3-12 as piping/fitting components.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.12-02 acceptable because the applicant stated that the flexible connections are stainless steel instrument tubing expansion loops and are included in LRA Table 2.3.3-12. Therefore, the staff's concern described in RAI 2.3.3.12-02 is resolved.

2.3.3.12.3 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 CG 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 CG system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.13 Plant Sample System

2.3.3.13.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13 describes the plant sample (SM) system. The SM system is an auxiliary system that is designed to provide samples for laboratory analysis to evaluate reactor coolant and other auxiliary systems' chemistry during normal operation. It has no emergency function. This system is normally isolated at the containment boundary. The SM system includes the Reactor Hot Sampling and the Sampling subsystems. The SM system is a standby system. The SM system for each PINGP Unit consists of sample connections, heat exchangers, pressure cylinders, sinks and necessary piping, valves, and instrumentation. In LRA Table 2.3.3-13, the applicant identifies SM system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.13.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13-01, UFSAR Section 10.3.5, and the license 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 2.3.3.13-01, dated November 19, 2008, the staff noted drawing LR-XH-248-1-3, location D2, shows hot lab pump HP2 discharge pressure indicator, PI-H3, as not in-scope for license renewal. The PI-C3 pressure indicator, which is similar to PI-H3, is in-scope for 10 CFR 54.4(a)(2). The staff asked the applicant to provide additional information explaining why pressure indicator PI-H3 is not in-scope.

In its response, dated December 18, 2008, the applicant stated discharge pressure indicator PI-H3 is within the scope of license renewal per 10 CFR 54.4(a)(2) and should be highlighted.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-01 acceptable because the applicant clarified that discharge pressure indicator PI-H3 is within the scope of license renewal for 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.3.13-01 is resolved.

2.3.3.13.3 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 SM 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 SM system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1)

2.3.3.14 Primary Containment Ventilation System

2.3.3.14.1 Summary of Technical Information in the Application

LRA Section 2.3.3.14 describes the primary containment ventilation (ZC) system. The ZC system includes several subsystems: The containment air cooling subsystem is designed to remove heat from containment during normal plant operation and during and following DBEs. The containment dome recirculation subsystem is designed to circulate and mix gases following a loss-of-coolant accident to prevent hydrogen accumulation. The containment vacuum relief subsystem is designed to protect the reactor containment vessel against excess differential pressures. The containment internal cleanup subsystem is designed to re-circulate containment air through filters to clean up containment atmosphere prior to limited personnel access. The containment purge and inservice purge subsystems are designed to provide fresh, tempered air for comfort during maintenance and refueling operations and to purge containment air through high efficiency particulate (HEPA) and charcoal filters. In LRA Table 2.3.3-14, the applicant identifies ZC system component types it believes are 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 5.2.1, 5.2.2, 5.2.3, 5.3.2, 5.4.2.3, 6.3.1, and 10.3.7, and the license 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 2.3.3.14-01 dated December 16, 2008, the staff noted the boundary drawings identified containment dome air recirculation fans as out-of scope of license renewal, whereas the remaining portion of the system is shown within the scope of license renewal. The staff asked the applicant to verify that the boundary drawings were correct or to provide justification why the containment dome air recirculation fans were not in-scope for license renewal.

In its response, dated January 15, 2009, the applicant stated that the scoping of the motor/fan assembly is incorrect and that the assembly should be within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The applicant further stated that the motor/fan assembly is an active component, therefore, does not require AMR, and is not included in LRA Table 2.3.3-14.

The staff reviewed the applicant's response to RAI 2.3.3.14-01 and finds it acceptable because the applicant stated that the motor/fan assembly is in the scope of license renewal and, being an active component, is not subject to AMR.

In RAI 2.3.3.14-02, dated December 16, 2008, the staff noted a note in a boundary drawing referring to "spent fuel pool emergency ventilation." The staff asked the applicant to describe this system or, if it is incorrect, to provide the correct name for "spent fuel pool special ventilation."

In its response, dated January 15, 2009, the applicant stated the spent fuel pool emergency ventilation is the same system as discussed in LRA Section 2.3.3.14, spent fuel pool special ventilation subsystem and is evaluated as a part of the primary containment ventilation system.

The staff reviewed the applicant's response to RAI 2.3.3.14-02 and finds it acceptable because the applicant clarified that the spent fuel pool emergency ventilation is the same as the spent fuel pool special ventilation subsystem which is a part of the primary containment ventilation system.

In RAI 2.3.3.14-03 dated December 16, 2008, the staff noted that the boundary drawings identified the inservice purge exhaust fans, which belong to the spent fuel pool special ventilation subsystem and are required to exhaust air in the event of high radiation and a fuel handling accident, as out-of-scope for license renewal. The staff asked the applicant whether the boundary drawings were correct, and if so, to explain why the inservice purge exhaust fans are out-of-scope for license renewal.

In its response dated January 15, 2009, the applicant stated that the scoping of the inservice purge exhaust fan motor/fan assembly is incorrect and that the assembly should be within the scope of license renewal per 10 CFR 54.4(a)(1). The applicant further stated that the motor/fan assembly is an active component that does not require AMR and is therefore not included in LRA Table 2.3.3-14.

The staff reviewed the applicant's response to RAI 2.3.3.14-03 and finds it acceptable because the applicant stated that the motor/fan assembly is in the scope of license renewal and, being an active component, is not subject to AMR.

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 ZC 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 ZC system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.15 Radiation Monitoring System

2.3.3.15.1 Summary of Technical Information in the Application

LRA Section 2.3.3.15 describes the radiation monitoring (RD) system. The RD system is an auxiliary system designed to provide information to warn operations personnel of potential radiological hazards that have developed, give early warning of certain plant malfunctions indicated by changing radiological conditions, prevent or minimize the release of radioactivity by automatically isolating or redirecting plant processes, provide for routine monitoring of controlled plant offsite effluent releases, and provide accident monitoring information of plant conditions for use in accident assessment. The RD system includes the process, the area and the environmental radiation monitoring subsystems, and the health physics and laboratory radiation measuring subsystem. In LRA Table 2.3.3-15, the applicant identifies RD system component types it believes are 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 the applicant has appropriately identified the RD 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.16 Spent Fuel Pool Cooling System

2.3.3.16.1 Summary of Technical Information in the Application

LRA Section 2.3.3.16 describes the spent fuel pool cooling (SF) system. The SF system is an auxiliary system designed to remove the heat generated by stored spent fuel elements. The system provides purification of the spent fuel pool water, the RWST and the reactor cavity to reduce radiation levels and improve clarity. The SF system includes the spent fuel pool leakage and refueling pool cleanup subsystems. The SF system is an operating system. The SF system is shared by Unit 1 and Unit 2. The SF system consists of two pumps, two heat exchangers, filters, demineralizer, refueling water purification pumps, and the necessary piping (including the fuel transfer tube), valves, and instrumentation. In LRA Table 2.3.3-16, the applicant identifies SF system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.16.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.16; UFSAR Sections 1.2.8, 1.3.6, 10.2.1.2, 10.2.2, and Table 1.3-3, and the license 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 2.3.3.16-01, dated November 19, 2008, the staff noted that although the fuel-transfer tube is in-scope for license renewal per 10 CFR 54.4(a)(1) and (a)(3), there was little information describing the fuel-transfer tube or the license renewal boundary in the LRA. A drawing was not provided. The fuel-transfer tube and blind flange are also not included in LRA Table 2.3.3-16, "Spent Fuel Pool Cooling System." The staff asked applicant to (1) provide reference to an LRA drawing showing the fuel-transfer tube and license renewal boundaries, and (2) justify why the fuel-transfer tube and blank flange are not component types requiring an AMR in LRA Table 2.3.3-16.

In its response, dated December 18, 2008, the applicant stated that UFSAR Figure 12.3-16 shows the fuel transfer tubes. The fuel transfer tube is included in the portions of the spent fuel cooling system subject to an AMR, which is described in LRA Section 2.3.3.16. In addition to the fuel transfer tube, the blind flange and fuel transfer tube gate valve are also within the scope of license renewal and included in Table 2.3.3-16 as valves (transfer tube gate valve) and pipe/fittings (transfer tube and blind flange).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-01 acceptable because the applicant clarified that the fuel transfer tube gate valve is evaluated as a valve and the fuel transfer tube and blind flange are evaluated as piping/fittings in LRA Table 2.3.3-16. Therefore, the staff's concern described in RAI 2.3.3.16-01 is resolved.

2.3.3.16.3 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 spent fuel pool 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 spent fuel pool cooling system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.17 Station and Instrument Air System

2.3.3.17.1 Summary of Technical Information in the Application

LRA Section 2.3.3.17 describes the station and instrument air (SA) system. The SA system is an auxiliary system that is designed to provide a continuous supply of oil-free, dry, instrument air as required. The system also provides oil-free, compressed service air to hose stations throughout the plant and to the condensate polishing backwash air supply subsystem for resin backwashing operations. The SA system includes the backup accumulators and compressed air subsystems that provide backup air for the RCS power-operated relief valves (PORVs), the turbine driven auxiliary feedwater pump steam admission control valves, the CL system strainer backwash valves and safeguards chilled water subsystem components. The SA system is an operating system. The instrument air subsystem consists of compressors, coolers, dryers, receivers and the necessary piping, valves and instrumentation to supply a common air header that supplies separate headers for each unit. In LRA Table 2.3.3-17, the applicant identifies SA system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.17.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.17, UFSAR Sections 4.4.2.3.1, 8.4.2, 10.3.10.1, 10.4.1.2, 10.4.3.2, 11.8.2.4, and 11.9.2.2 and the license 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 2.3.3.17-01, dated November 19, 2008, the staff noted the boundary drawings of LR-39253-3, location C-7, depicted several lines from air compressor #124 as in-scope for license renewal for 10 CFR 54.4(a)(2); whereas, similar lines from air compressor #125 are in-scope for license renewal for 10 CFR 54.4(a)(3). The staff also noted that LRA Section 2.3.3-17, "Station and Instrument Air System," does not indicate that any portion of the station and instrument air system is in-scope for 10 CFR 54.4(a)(2). The staff asked the applicant to provide additional information explaining why there is a different in-scope classification between the lines out of air compressors #124 and #125. In addition, the staff asked the applicant to explain why if the sections of pipe currently in-scope for 10 CFR 54.4(a)(2) on license renewal drawing LR-39253-3 remain in-scope for 10 CFR 54.4(a)(2), LRA Section 2.3.3.17 does not address components in-scope for 10 CFR 54.4(a)(2).

In its response, dated December 18, 2008, the applicant clarified that air compressor #125 is used as a backup for fire protection safe shutdown, whereas air compressor #124 is not required for fire protection safe shutdown and that the difference is the reason for the different in-scope classifications. The applicant also clarified that the lines that are shown in-scope due to the different scoping criteria are the cooling water system supply and return lines and are evaluated in the cooling water system.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17-01 acceptable because the applicant clarified the scope classification of the lines from the air compressors as well as the scope classification description in LRA Section 2.3.3.17. Therefore, the staff's concern described in RAI 2.3.3.17-01 is resolved.

In RAI 2.3.3.17-02, dated November 19, 2008, the staff noted the boundary drawing LR-39253-3, location A-8, shows the 2-2CL-50 line as in-scope for license renewal for 10 CFR 54.4(a)(3); whereas, the continuation of this 2-inch line on drawing LR-39217-1 is in-scope for license renewal for 10 CFR 54.4(a)(2). The staff asked the applicant to explain the different in-scope classifications in drawing LR-39253-3 and the continuation on drawing LR-39217-1.

In its response, dated December 18, 2008, the applicant stated the scoping classification of line 2-2CL-50 is incorrect. The line is in-scope for 10 CFR 54.4(a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17-02 acceptable because the applicant clarified the scope classification of the 2-2CL-50 line continuation. Therefore, the staff's concern described in RAI 2.3.3.17-02 is resolved.

In RAI 2.3.3.17-03, dated November 19, 2008, the staff noted that drawing LR-39244, location C-1, downstream of SA-85-2, shows a 1/2-inch line as not in-scope for license renewal. The line is directly connected to the safety valve and the upstream 3/4-inch line that are within the scope of license renewal. The staff asked the applicant to explain why these sections of pipe and components are not within the scope of license renewal and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response, dated December 18, 2008, the applicant clarified that the scoping classification of the 1/2-inch line is incorrect. The 1/2-inch line is in-scope for license renewal per 10 CFR 54.4(a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17-03 acceptable because the applicant clarified the scope classification of the 1/2-inch line. Therefore, the staff's concern described in RAI 2.3.3.17-03 is resolved.

In RAI 2.3.3.17-04, dated November 19, 2008, the staff noted the boundary drawings LR-39244, location C-1, downstream of SA-115-1, shows a 3/8-inch line and the associated control valve CV 31148 as not in-scope for license renewal. This line is directly connected to a 1-inch line that is within the scope of license renewal. The staff asked the applicant to explain why the sections of pipe and components are not within the scope of license renewal and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response, dated December 18, 2008, the applicant clarified that the scoping classification of the 3/8-inch line is incorrect. The 3/8-inch line is in-scope for license renewal per 10 CFR 54.4(a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17-04 acceptable because the applicant clarified the scope classification of the 3/8-inch line. Therefore, the staff's concern described in RAI 2.3.3.17-04 is resolved.

In RAI 2.3.3.17-05, dated November 19, 2008, the staff noted drawing LR-39243, locations F-8 through F-10, upstream of 2SA-2-71, shows a 3-inch line as not in-scope for license renewal. This line is directly connected to the upstream 3-inch line and downstream 3-inch line, both of which are within the scope of license renewal. The staff asked the applicant to explain why this section of pipe are not within the scope of license renewal and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated December 18, 2008, the applicant clarified that the scoping classification of the 3-inch line is incorrect and the line should be shown in-scope for license renewal per 10 CFR 54.4(a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17-05 acceptable because the applicant clarified the scope classification of the 3" line. Therefore, the staff's concern described in RAI 2.3.3.17-05 is resolved.

In RAI 2.3.3.17-06, dated November 19, 2008, the staff noted drawings LR-39243, location D-9, shows a 1/2-inch line and valve 2SA-19-2 as not in-scope for license renewal. This line is directly connected to the 1-inch line that is within the scope of license renewal. The staff asked the applicant to explain why this section of pipe are not within the scope of license renewal and justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response dated December 18, 2008, the applicant clarified that the scoping classification of the 1/2-inch line and valve 2SA-19-2 is incorrect. The 1/2-inch line and valve 2SA-19-2 are in-scope for license renewal per 10 CFR 54.4(a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17-06 acceptable because the applicant clarified the scope classification of the 1/2-inch line and valve 2SA-19-2. Therefore, the staff's concern described in RAI 2.3.3.17-06 is resolved.

2.3.3.17.3 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 SA air 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 SA system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.18 Steam Exclusion System

2.3.3.18.1 Summary of Technical Information in the Application

LRA Section 2.3.3.18 describes the steam exclusion (SE) system, which is designed to provide ventilation isolation to protect the systems and components from potentially harsh environments due to a HELB. The failure of nonsafety-related SSCs in the SE system potentially could prevent the satisfactory accomplishment of a safety-related function. In LRA Table 2.3.3-18, the applicant identifies SE system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.18.2 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 the applicant has appropriately identified the SE 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.19 Turbine and Administration Building Ventilation System

2.3.3.19.1 Summary of Technical Information in the Application

LRA Section 2.3.3.19 describes the turbine and administration building ventilation (ZB) system, which includes several subsystems. The ZB system subsystems are auxiliary systems designed to provide tempered air and remove exhaust air to provide a suitable working environment and maintain temperatures required by machinery in various buildings and areas throughout the plant. In addition, the technical support center (TSC) ventilation and cleanup subsystem operates to provide emergency response facility habitability under accident conditions. The ZB system includes the turbine building, old admin building, new admin building, cold chemical lab, and TSC ventilation and cleanup subsystems. In LRA Table 2.3.3-19, the applicant identifies ZB system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.3.19.2 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 the applicant has appropriately identified the ZB 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 ZB system components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.3.20 Waste Disposal System

2.3.3.20.1 Summary of Technical Information in the Application

LRA Section 2.3.3.20 describes the Waste Disposal (WD) system. The WD system is an auxiliary plant system that is designed to collect, process, store and dispose of all potentially radioactive reactor plant wastes while meeting the limits established by regulations for release of wastes from the plant site. The WD system consists of the waste liquid, waste gas and waste solid disposal subsystems and the site miscellaneous maintenance subsystem. The waste gas, waste liquid and site miscellaneous maintenance subsystems are operating systems. The waste solid subsystem is a standby system. The waste liquid disposal subsystem is shared by Unit 1 and Unit 2, and consists of tanks, filters, pumps, ion exchangers, evaporators, and the necessary piping, valves, and instrumentation. In LRA Table 2.3.3-20, the applicant identifies WD system component types its believes are within the scope of license renewal and subject to an AMR.

2.3.3.20.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.20, UFSAR Sections 1.2.9, 1.3.5, 9.1.1, 9.1.2, 9.3.2, 9.4.2, 11.8.2.3, 14.5.3, and 14.5.3.2, and the license 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 2.3.3.20-01, dated November 19, 2008, the staff noted that drawing LR-XH-1-123, locations C-5 and C-7 shows two seismic endpoints on 3/8-inch reactor coolant drain tank piping exiting containment as not in-scope. The valves, 1-9159B and 2-9159B, that the seismic endpoints are connected to, are shown as within the scope of license renewal for 10 CFR 54.4(a)(1). The staff asked the applicant why it did not include the seismic endpoint downstream of valves 1-9159B and 2-9159B within the scope of license renewal.

In its December 18, 2008 response, the applicant stated in part:

> …that the seismic endpoints represent points where the piping within the scope of license renewal is decoupled from the downstream piping. In this case, the smaller branch lines (3/8-inch tubing), do not provide support for the pressure boundary valves and the scoping boundary ends at each valve. The seismic endpoint symbol does not represent a component and is correctly shown as not within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-01 acceptable because the applicant clarified that the seismic endpoints do not provide support for the pressure boundary valves and the scoping boundary ends at each valve. Therefore, the staff's concern described in RAI 2.3.3.20-01 is resolved.

In RAI 2.3.3.20-02, dated November 19, 2008, the staff noted that drawing LR-XH-1-123, locations A-2 and A-10, shows 3/8-WL-1 and 3/8-2WL-1 lines in-scope for license renewal for 10 CFR 54.4(a)(1) or 10 CFR 54.4(a)(3). However, the continuation of this line on drawings LR-XH-1-7, location D-8, and LR-XH-1001-3, location D-8, shows this line is in-scope for 10 CFR 54.4(a)(2). The staff asked the applicant to explain why there is a different in-scope classification between drawing LR-XH-1-123 and the continuations on drawings LR-XH-1-7 and LR-XH-1001-3.

In its response, dated December 18, 2008, the applicant stated that the reactor flange leakoff lines are within the scope of license renewal per 10 CFR 54.4(a)(2) and should be highlighted.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-02 acceptable because the applicant clarified that the reactor flange leak off lines are within the scope of license renewal per 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.3.20-02 is resolved.

In RAI 2.3.3.20-03, dated November 19, 2008, the staff noted that drawing LR-39248, location E-8, shows piping 2-WG-68 from the gas decay tank condensate drain pump as in-scope for license renewal for 10 CFR 54.4(a)(2). However, the continuation of this line on drawing LR-XH-1-124, location E-12, 1-inch piping 1-WG-68 shows this line as not in-scope for license renewal. The staff asked the applicant to explain why there is a different in-scope classification between drawing LR-39248 and the continuation on drawing LR-XH-1-124.

In its response, dated December 18, 2008, the applicant stated that the pit entry wall is shown on drawing LR-XH-1-124, location E-12, at the gas decay tank condensate drain pump discharge line, 1-WG-68. This wall provides the scoping break between the portion of the line that is within the scope of license renewal and the portion that is not within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-03 acceptable because the applicant clarified the location of the scoping break for the gas decay tank condensate drain pump discharge line. Therefore, the staff's concern described in RAI 2.3.3.20-03 is resolved.

In RAI 2.3.3.20-04, dated November 19, 2008, the staff noted drawing LR-39248, location D-7, shows 3/8-inch tubing from valve 2CV-38-4 as in-scope for license renewal for 10 CFR 54.4(a)(2). However, the continuation of this line on drawing LR-XH-1-1001-5, location F-2, shows valve 2CV-38-4 as in-scope for 10 CFR 54.4(a)(1) or 10 CFR 54.4(a)(3). The staff asked the applicant to explain why there is a difference in-scope classification between drawing LR-39248 and the continuation on drawing LR-1-1001-5.

In its response, dated December 18, 2008, the applicant stated the stem leak-off line and valve 2VC-38-4 should be shown as within the scope of license renewal per 10 CFR 54.4(a)(2), not 10 CFR 54.4(a)(1) or (a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-04 acceptable because the applicant clarified that the CV-31211 stem leak-off line and valve 2VC-38-4 are within-scope of license renewal per 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.3.20-04 is resolved.

In RAI 2.3.3.20-06, dated November 19, 2008, the staff noted that drawing LR-XH-1-124 shows nine gas decay tanks (#121, #122, #123, #124, #125, #126, #127, #128, and #129) as not in-scope for license renewal. However, at multiple tank isolation valve locations, it shows that the tanks are classified as safety-related (QA Class IC). The staff asked applicant to explain why these QA Class IC gas decay tanks and associated components are not within the scope of license renewal for 10 CFR 54.21(a)(1), see SER section 2.1.4.1 for a detailed discussion.

2.3.3.20.3 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 waste disposal 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 waste disposal mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1), except for the classification of the waste decay tanks and associated components identified in RAI 2.1.1-01 (see SER section 2.1.4.1 for a detailed discussion).

2.3.3.21 Water Treatment System

2.3.3.21.1 Summary of Technical Information in the Application

LRA Section 2.3.3.21 describes the water treatment (DE) system. The DE system is an auxiliary system that supplies demineralized and domestic (potable) water to meet plant requirements. The DE system includes the domestic water and sewer subsystems. The DE system is an operating system. The DE system is shared by Unit 1 and Unit 2, and consists of wells, tanks, pumps, ion exchangers, reverse osmosis units, and the necessary piping, valves, and instrumentation. In LRA Table 2.3.3-21, the applicant identifies DE system component types it believes are 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 the applicant has appropriately identified the DE 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4 Steam and Power Conversion Systems

LRA Section 2.3.4 identifies the PINGP 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 Feedwater System
2.3.4.2 Bleed Steam System
2.3.4.3 Circulating Water System
2.3.4.4 Condensate System
2.3.4.5 Feedwater System
2.3.4.6 Main Steam System
2.3.4.7 Steam Generator Blowdown System
2.3.4.8 Turbine Generator System

The staff's findings on review of LRA Sections 2.3.4.1–2.3.4.8 are in SER Sections 2.3.4.1–2.3.4.8, respectively.

2.3.4.1 Auxiliary Feedwater System

2.3.4.1.1 Summary of Technical Information in the Application

LRA Section 2.3.4.1 describes the Auxiliary Feedwater (AF) system. The AF system is a steam and power conversion system that provides feedwater to the steam generators for heat removal from the RCS during and following DBEs, including loss of normal feedwater, steam generator tube rupture, main steam or feedwater line break, small break LOCA, and during normal operation, such as startup and shutdown, when the main feedwater system is not available. The AF system for each unit consists of one turbine-driven and one electric-driven pump and the necessary piping, valves and instrumentation. In LRA Table 2.3.4-1, the applicant identifies AF system component types it believes are 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 the applicant has appropriately identified the AF 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.2 Bleed Steam System

2.3.4.2.1 Summary of Technical Information in the Application

LRA Section 2.3.4.2 describes the bleed steam (BL) system. The BL system is a steam and power conversion system that is designed to improve turbine cycle efficiency by using turbine exhaust steam for feedwater heating. The BL system includes the heater vents subsystem. The BL system is an operating system. The BL system for each PINGP unit consists of the necessary piping, valves and instrumentation for supplying turbine exhaust steam to the feedwater heaters for feedwater heating. In LRA Table 2.3.4-2, the applicant identifies BL system component it believes are types within the scope of license renewal and subject to an AMR.

2.3.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.2, UFSAR Section 11.7, and the license 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 RAIs as discussed below.

In RAI 2.3.4.2-01, dated November 19, 2008, the staff noted drawing LR-39224, locations D-2, and E-2, depicted FW Heaters #15A and #15B as not in-scope for license renewal whereas the corresponding Unit 2 FW Heaters #25A and #25B are shown as in-scope on drawing LR-39225. The staff also noted that the FW heaters are not included in LRA Table 2.3.4-2 Bleed Steam System, as component type subject to an AMR.

In its response, dated December 18, 2008, the applicant stated that the feedwater heaters #15A and #15B are contained within the shell and that their failure will not affect any SR components. The applicant also stated that the shells and channel heads are shown as within the scope of license renewal per 10 CFR 54.4(a)(2). The applicant also explained that the feedwater heaters are evaluated and included as heat exchanger components in LRA Table 2.3.4-5, Feedwater System.

The applicant also stated that the feedwater heater, and reheater tube and tubesheet scoping is generally incorrect on drawings LR-39224, and LR-39225. Drawings LR-39218 and 39219 also contain incorrect scoping for several reheater tubes and tubesheet. The applicant identified the correct systems, drawings, and tables that contain the components.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.2-01 acceptable because the applicant clarified the scope classification of the feedwater heaters in question and identified the component types subject to an AMR. The applicant identified other instances of incorrect scoping and stated where the correct scoping could be found for feedwater heaters and reheater tubes, and tubesheets. Therefore, the staff's concern described in RAI 2.3.4.2-01 is resolved.

2.3.4.2.3 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 BL 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 BL system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.3 Circulating Water System

2.3.4.3.1 Summary of Technical Information in the Application

LRA Section 2.3.4.3 describes the circulating water (CW) system. The CW system is a steam and power conversion system that provides the heat sink for the generating plant. In addition, the CW system supplies water to the CL system and the FP system and provides a means of back flushing the emergency cooling water (CL) intake line. The CW system includes the external and internal circulating water subsystems, the screen wash subsystem, the condenser tube cleaning subsystem and the condenser water box vent and drain subsystem. In LRA Table 2.3.4-3, the applicant identifies CW system component types it believes are 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 Sections 2.9.3, 10.4.1.2.2, 11.5, Figures 10.3-1, 11.1-16 and 11.1-17 and the license 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 2.3.4.3-01, dated November 19, 2008, the staff noted drawing LR-39215-1, locations B-7, B-8, B-10, and B-11 depicted condensers #1A, #1B, #2A, and #2B as not in-scope for license renewal whereas the same condensers are shown as in-scope on drawing LR-39215-1 locations E-2, E-3, E-5, and E-6.

In its response, dated December 18, 2008, the applicant stated the condensers should be highlighted to show them as within the scope for 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.4.3.-01 acceptable because the condensers are in-scope for 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.4.3.-01 is resolved.

2.3.4.3.3 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 CW 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 CW system mechanical components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.4 Condensate System

2.3.4.4.1 Summary of Technical Information in the Application

LRA Section 2.3.4.4 describes the condensate (CD) system. The CD system is a steam and power conversion system that is designed to remove condensate from the hotwell of the condenser and supply the FW system for heat removal from the RC system at all load conditions. The CD system condensate storage tanks provide the normal source of water to the AF system for heat removal from the RC system during accident and normal plant conditions. The CD system includes the condensate polishing, chemical feed, gland seal water, and heater drain subsystems. The CD system is an operating system. The CD system for each Unit consists of the three condensate pumps, two parallel trains of feedwater heaters, drain coolers, turbine auxiliary component condensers, and the necessary piping, valves and instrumentation. In LRA Table 2.3.4-4, the applicant identifies CD system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.4.4.2 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 the applicant has appropriately identified the CD 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 CD system components subject to an AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

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 main feedwater (FW) system. The FW system is a steam and power conversion system designed to provide feedwater to the steam generators for heat removal from the reactor coolant system during normal plant conditions, producing steam for use in the turbine-generator. The FW system is an operating system. The FW system for each PINGP unit consists of two motor-driven main feedwater pumps, heaters, flow nozzles and the necessary piping, valves and instrumentation. The FW system increases the pressure of the condensate for delivery through one stage of feedwater heating and the feedwater regulating valves to the steam generators. In LRA Table 2.3.4-5, the applicant identifies FW system component types it believes are 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 the applicant has appropriately identified the FW 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 FW system components subject to an AMR 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 main steam (MS) system. The MS system is a steam and power conversion system designed to remove heat from the reactor coolant under accident and normal plant conditions, producing steam for use in the turbine generator. The system can receive and dispose of the total heat existent or produced in the RCS following a turbine generator trip at full load. The MS system is an operating system. The MS system for each PINGP unit consists of the necessary piping, valves and instrumentation designed to conduct steam from each of the two steam generators within the reactor containment through a swing-disc type isolation valve and a swing-disc type non-return valve to the turbine stop and control valves. In LRA Table 2.3.4-6, the applicant identifies MS system component types it believes are within the scope of license renewal and subject to an AMR.

2.3.4.6.2 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 the applicant has appropriately identified the MS 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.7 Steam Generator Blowdown System

2.3.4.7.1 Summary of Technical Information in the Application

LRA Section 2.3.4.6 describes the steam generator blowdown (SB) system. The SB system is a steam and power conversion system designed to remove chemical and particulate impurities from the steam generators and maintain chemical levels in the steam generators within an acceptable range. The SB system is an operating system. The SB system for each PINGP unit consists of a flash tank, heat exchangers, filters and transfer pump and the associated piping, valves and instrumentation. In LRA Table 2.3.4-7, the applicant identifies SB system component types it believes are 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 the applicant has appropriately identified the SB 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.4.8 Turbine Generator and Support System

2.3.4.8.1 Summary of Technical Information in the Application

LRA Section 2.3.4.6 describes the turbine generator and support (TB) system. The TB system is a steam and power conversion system that provides heat removal from the RC system during normal operation and the production of electricity. The system includes the air removal, electro-hydraulic control, gland sealing steam, miscellaneous drains and vents, turbine building traps and drains, turbine oil, turbine and turbine moisture separator subsystems. The TB system and subsystems are operating systems. The TB system for each PINGP unit consists of the turbine generators, including the electro-hydraulic control, gland sealing steam, turbine, turbine moisture separator and turbine oil subsystems, turning gear, cylinder heating, hydrogen cooling, tanks, heat exchangers, pumps and the necessary piping, valves and instrumentation. In LRA Table 2.3.4-8, the applicant identifies TB system component types it believes are 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 the applicant has appropriately identified the TB 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 AMR in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.4 Scoping and Screening Results: Containments, Structures, and Component Supports

This section documents the staff's review of the applicant's scoping and screening results for structures. The following structures and structural components are addressed in this section:

- 2.4.1 Auxiliary and Turbine Buildings
- 2.4.2 Component Supports
- 2.4.3 Cranes, Heavy Loads, Fuel Handling
- 2.4.4 D5/D6 Diesel Generator Building and Underground Storage Vault, Fuel Oil Transfer House, Old Service Building, and New Service Building
- 2.4.5 Fire Protection Barrier
- 2.4.6 Radwaste Building, Old Administration Building, and Administration Building Addition
- 2.4.7 Reactor Containment Vessels Unit 1 and Unit 2
- 2.4.8 SBO Yard Structures
- 2.4.9 Shield Buildings Unit 1 and Unit 2
- 2.4.10 Tank Foundations
- 2.4.11 Water Control Structures-Approach Canal, Emergency Cooling Water Intake, Intake Canal, and Screenhouse

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant identified and listed passive, long-lived SCs that it viewed as within the scope of license renewal and subject to an AMR. To verify that the applicant properly implemented its methodology, the staff focused its review on the implementation results. This approach allowed the staff to confirm that there were no omissions of structural components that meet the scoping criteria and are subject to an AMR.

The staff's evaluation of the information provided in the LRA was performed in the same manner for all structures. The objective of the review was to determine if the structural components that appeared to meet the scoping criteria specified in the Rule, were identified by the applicant as within the scope of license renewal, in accordance with 10 CFR 54.4. Similarly, the staff evaluated the applicant's screening results to verify that all long-lived, passive SCs were subject to an AMR in accordance with 10 CFR 54.21(a)(1).

To perform its evaluation, the staff reviewed the applicable LRA sections, focusing its review on components that had not been identified as within the scope of license renewal. The staff reviewed the UFSAR for each structure to determine if the applicant had omitted components with intended functions delineated under 10 CFR 54.4(a) from the scope of license renewal. The staff also reviewed the UFSAR to determine if all intended functions delineated under 10 CFR 54.4(a) were specified in the LRA. If discrepancies or omissions were identified, the staff requested additional information to resolve the issue.

Once the staff completed its review of the scoping results, the staff evaluated the applicant's screening results. For those components with intended functions, the staff sought to determine: (1) if the functions are performed with moving parts or a change in configuration or properties, or (2) if they are subject to replacement based on a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). For those that did not meet either of these criteria, the staff sought to confirm that these structural components were subject to an AMR as required by 10 CFR 54.21(a)(1). If discrepancies were identified, the staff requested additional information to resolve them. The staff requested additional information, by letter dated December 1, 2008, to resolve any lack of clarity, omissions or discrepancies identified.

2.4.1 Auxiliary Building and Turbine Building

2.4.1.1 Summary of Technical Information in the Application

LRA Section 2.4.1 describes the auxiliary building and the turbine building, which are shared by the two units. The auxiliary building, an integral part of the power house complex, is a multi-level reinforced concrete and steel framed structure on a mat foundation and houses both safety-related and nonsafety-related SSCs. The mat foundation, reinforced concrete structure above the foundation, main load carrying structural steel frame, and the auxiliary building crane support steel are safety-related. The reinforced concrete structure acts as secondary containment and provides shelter and protection for safety-related SSCs. The structural steel frame provides shelter and protection for the auxiliary building crane and portions of the safety-related concrete structure. The auxiliary building houses the spent fuel pools, new fuel pit, the refueling water storage tanks and the control room.

The turbine building is a multi-level reinforced concrete structure and steel framed structure, built on a 3 ft to 5 ft thick mat foundation, housing safety-related and non safety-related SSCs and providing a flood barrier. The safety-related portions of the turbine building include the reinforced concrete aisle, the main load carrying structural steel frame, and the turbine building crane structural steel support members. The structural steel frame provides shelter and protection and weatherproof enclosure for the SSCs in the reinforced concrete aisle. Non safety-related components of the auxiliary and turbine buildings include building secondary members, turbine generator foundation, steel siding, and others.

In LRA Table 2.4.1-1, the applicant identifies the components it believes are subject to aging management review for the auxiliary building and turbine building by component type and intended function. In the first column of LRA Table 3.5.2-1, the applicant lists the SCs included within each component type group in LRA Table 2.4.1-1.

2.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.1, the first three columns of LRA Table 3.5.2-1, LR drawing LR-193817 and UFSAR Sections 1.3.2, 1.3.10 and 12.2, using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, the staff evaluated the structural component functions described in the LRA and 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 an area 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 RAI as discussed below.

Due to a lack of clarity in LRA Tables 2.4.1-1 and 3.5.2-1, in RAI 2.4.1-1 dated December 1, 2008, the staff requested the applicant to confirm/clarify if the SFP divider gates, the SFP leak-chase channels, and the fuel transfer canal upending frame are structural components within the scope of license renewal and subject to an AMR. If the applicant viewed the structures and components as in-scope, the applicant was requested to include their scoping, screening and AMR results, as appropriate, or clarify the location in the LRA where these components are addressed. If the applicant took the position that the structures and components are not in-scope, the applicant was requested to provide a justification for exclusion.

In its response to RAI 2.4.1-1, dated December 11, 2008, the applicant stated that the SFP divider gates are not in-scope of license renewal since they do not perform a LR-intended function. The applicant explained that, as discussed in UFSAR Section 10.2.2.3, to protect against complete loss of water in the SFP, the SFP cooling system piping connections enter the top of the pool. The drain connection from the transfer canal to the CVSC holdup tank recirculation pump is at the canal's bottom. The applicant further explained that even if the water in the transfer canal were completely drained with the SFP gate removed, the active portion of the spent fuel would not be uncovered because the bottom of the gate connection in the wall separating the transfer canal from the SFP is at an elevation that would preclude complete drainage.

The applicant also stated in its response that the SFP leak-chase channels are in-scope of license renewal. The applicant clarified that these components are located in the Auxiliary Building, are fabricated from stainless steel, and are located in an embedded-in-concrete environment. The applicant clarified that the SFP leak-chase channel component is included in LRA Table 2.4.1-1 on page 2.4-9 as part of the "stainless steel components" group, and in LRA Table 3.5.2-1 on page 3.5-77 as part of line item, "stainless steel components (embedded members)."

The applicant also stated that the fuel transfer canal upender (or tipping device) is in-scope of license renewal. The applicant clarified that the upending frame is part of the fuel transfer tipping device identified in LRA Section 2.4.3 on page 2.4-18 and included in LRA Table 3.5.2-3 on pages 3.5-115 and 3.5-116 for aging management of the fuel transfer tipping devices.

Based on its review, the staff finds the applicant's response to RAI 2.4.1-1 acceptable because the applicant has confirmed that the SFP leak-chase channels and the fuel transfer canal upending frame (or tipping device) are within the scope of LR and subject to AMR and made reference to the location in the LRA where they were addressed. The staff confirmed that these components were included in the LRA tables and sections referenced by the applicant in its response. The staff finds that the SFP divider gates do not perform a LR-intended function and the explanation provided by the applicant justified its exclusion from the scope of LR. Thus, the staff's concerns described in RAI 2.4.1-1 are resolved.

2.4.1.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and related structural components to determine whether the applicant failed to identify any SCs within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the Auxiliary Building and Turbine Building SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.2 Component Supports

2.4.2.1 Summary of Technical Information in the Application

LRA Section 2.4.2 describes component supports as structural support members used to transfer loads from systems and components to building structures. They are located in buildings housing safety-related equipment, and at plant locations where in-scope equipment can be found. Since their components, materials, and environments are similar, the applicant evaluated component supports as a plant-wide commodity, and rather than commodities to a specific building. Component supports include insulation/insulation jacket and support members for mechanical equipment, electrical and I & C equipment. Support members include steel wide-flange and I beams, channels, angles, tees, plates, bars, shims, clip angles, banding, build-up sections, rods, cables, bolts, nuts, washers, welds, spring hangers, guides, stops, slide plates, isolation elements, concrete anchors, grout and concrete local to the anchors, and grout pads beneath equipment. In LRA Table 2.4.2-1, the applicant identifies the components it believes are subject to AMR for the component supports by component type and intended function. In the first column of LRA Table 3.5.2-2, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.2-1.

2.4.2.2 Conclusion

The staff followed the evaluation methodology discussed in Section 2.4 and reviewed LRA Section 2.4.2, the first three columns of LRA Table 3.5.2-2, and UFSAR Section 12.2 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the component supports SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.3 Cranes, Heavy Loads, and Fuel Handling System Components

2.4.3.1 Summary of Technical Information in the Application

LRA Section 2.4.3 describes the structural components of cranes, heavy loads, and the fuel handling system components within the scope of license renewal as all load carrying components associated with heavy load handling systems and light load refueling handling systems, which provide structural support to safety-related components relied upon to remain functional to ensure satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1) and/or provide structural support to nonsafety-related components whose failure, per 10 CFR54.4(a)(2), could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). Cranes included are the containment polar cranes, turbine building cranes, auxiliary building crane, spent fuel pool bridge crane, crane above safeguard traveling screens, manipulator cranes and special lifting devices. In LRA Table 2.4.3-1, the applicant identifies the components it believes are subject to AMR for the cranes, heavy loads, and fuel handling systems by component type and intended function. In the first column of LRA Table 3.5.2-3, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.3-1.

2.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.3, the first three columns of LRA Table 3.5.2-3, and UFSAR Sections 10.2, 12.2, UFSAR Tables 12.2-1 and 12.2-40, and UFSAR Figure 10.2-1 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, the staff evaluated the structural component functions described in the LRA and 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 2.4.3 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results, to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The applicant responded to the staff's RAI as discussed below.

In RAI 2.4.3-1, dated December 1, 2008, the staff noted that in UFSAR Section 12.2.6, the applicant states that in order to assure the stability and prevent toppling and over-traveling of the containment polar crane or its components, the features incorporated in its design include the following: (i) up-kick lugs fastened to each truck; (ii) overturning locks fastened to each truck; and (iii) positive wheel stops. Also, in UFSAR Section 12.2.9, the applicant indicates that the spent fuel pool bridge crane, auxiliary building crane and the turbine building crane are protected against tipping, derailments and uncontrolled movements by features that include the following: (i) crane bridge and trolley being equipped with fixed, fitted rail yokes; and (ii) positive wheel stops and bumpers. From LRA Section 2.4.3, Table 2.4.3-1 and Table 3.5.2-3, it was not clear to the staff whether the above noted structural components and fasteners of the cranes are included in-scope of license renewal and subject to an AMR. The staff requested the applicant to confirm that these crane components have been screened in as items requiring an AMR, and if so, to indicate where these items have been included in the LRA, and if not, to provide the technical bases for their exclusion.

In its response, dated December 11, 2008, the applicant stated that structural components and fasteners for the containment polar crane (up-kick lugs, overturning locks, positive wheel stops), spent fuel pool bridge crane, auxiliary building crane, and the turbine building crane (fixed, fitted rail yokes, and positive wheel stops and bumpers) identified in Sections 12.2.6 and 12.2.9 of the UFSAR, are in-scope of license renewal and subject to an AMR. The applicant further clarified that these components were characterized as miscellaneous load carrying components included in the description in LRA Section 2.4.3, and also included in LRA Table 2.4.3-1 under the component heading, "Cranes-Rails" and "Cranes-Structural Girders." The applicant also clarified that these components are further defined in Table 3.5.2-3 as "Cranes - structural girders (load carrying structural members, welded and bolted connections ....)," and "Cranes-rails (rails and associated welded and bolted connections ....)." The applicant noted that bumpers are considered subcomponents of the crane structural assembly and are not explicitly called out.

Based on its review, the staff finds the applicant's response to RAI 2.4.3-1 acceptable because the applicant has confirmed that the specific crane structural components described in RAI 2.4.3-1 are within the scope of LR and subject to AMR, and are either characterized as miscellaneous load carrying components or considered subcomponents of the crane structural assembly. The applicant further clarified that these components were included in LRA Table 2.4.3-1 as part of the component heading, "Cranes - Rails" and "Cranes - Structural Girders" and were further defined in LRA Table 3.5.2-3 as part of "Cranes - structural girders (load carrying structural members, welded and bolted connections ....)," and "Cranes - rails (rails and associated welded and bolted connections ....)." The staff confirmed that these component headings were provided in LRA Tables 2.4.3-1 and 3.5.2-3. Thus, the staff's concerns described in RAI 2.4.3-1 are resolved.

2.4.3.3 Conclusion

The staff reviewed the LRA, RAI response, UFSAR, and related structural components to determine whether the applicant failed to identify any SCs within the scope of license renewal. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the cranes, heavy loads, and fuel handling system SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.4 D5/D6 Diesel Generator Building and Underground Storage Vault, Fuel Oil Transfer House, Old Service Building, and New Service Building

2.4.4.1 Summary of Technical Information in the Application

LRA Section 2.4.4 describes the D5/D6 diesel generator building and underground storage vault, fuel oil transfer house, old service building, and new service building. The D5/D6 diesel generator building is a safety-related reinforced concrete structure supported on a 4-foot-thick step-down independent mat foundation, located along the west wall of the Auxiliary Building and houses safety-related SSCs including the D5 and D6 diesel generators. Compressible material is used to achieve the specified spacing between the D5/D6 diesel generator building and adjacent auxiliary and turbine buildings. Exterior flood panels protect equipment from water intrusion from a design flood.

Four safety-related fuel oil storage tanks are located in the Underground Storage Vault along the west wall of the D5/D6 diesel generator building. The safety-related reinforced concrete vault is a rectangular structure founded on engineered fill, consisting of a minimum 2-foot-thick foundation mat, 1.67-foot-thick exterior walls, and the 1.5-foot-thick roof slab at grade level. W24 x 84 steel beams are used to support the vault roof slab and other design loads. A 1-foot-thick internal partition wall divides the vault into two compartments. The walls provide fire and flood protection between each diesel generator set's fuel supply equipment. The vault provides the required 3-hour rated fire protection barrier, as do vault penetrations at the D5/D6 interface. Additionally, the vault is designed to withstand the effects of tornado generated missiles, site flood, buoyancy forces, seismic loads, and vehicular traffic on its roof.

The fuel oil transfer house, also known as the filter house, is a small structure located northeast of the Turbine Building. The structure is supported on reinforced concrete footings poured at an elevation of 689-feet and 9-inches, and reinforced concrete walls up to an elevation of 694 feet. A 1-foot-thick reinforced concrete floor slab rests on top of the concrete walls. Masonry block walls make up the exterior walls above the floor slab and extend up to the roof at an elevation of 708 feet and 2 inches. Components in-scope of license renewal are located below the concrete floor slab.

The old service building is a multi-level reinforced concrete and steel framed structure with its foundation in continuity with the Auxiliary/Turbine/Shield Building complex. It houses the safety-related D1/D2 emergency diesel generators and other nonsafety-related SSCs.

The new service building is a three-story steel framed structure located adjacent to the east walls of the old service building and Turbine Building. Its reinforced concrete foundation is built on grade and is designed to accommodate various existing buried components including the circulating water concrete pipes. The D1/D2 fuel oil tank supply and return lines from the Fuel Oil Transfer House run through the concrete support bridges under the New Service Building ground floor. Housed within the structure are the 480-volt buses, batteries, and associated cable trays and conduits that are components relied on to perform a function in compliance with the SBO regulated event, as are the non-safeguards uninterruptible power supply and event monitoring inverters that are relied upon to perform a function in compliance with the ATWS regulated event.

In LRA Table 2.4.4-1, the applicant identifies the components it believes are subject to an AMR for the D5/D6 diesel generator building and underground storage vault, fuel oil transfer house, old service building, and new service building by component type and intended function. In the first column of LRA Table 3.5.2-4, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.4-1.

2.4.4.2 Conclusion

The staff followed the evaluation methodology discussed in Section 2.4 and reviewed LRA Section 2.4.4, the first three columns of LRA Table 3.5.2-4, LR drawing LR-193817 and UFSAR Sections 1.3.2, 1.3.10, 7.11 and 12.2 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the D5/D6 diesel generator building and underground storage vault, fuel oil transfer house, old service building, and new service building SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.5 Fire Protection Barriers

2.4.5.1 Summary of Technical Information in the Application

LRA Section 2.4.5 describes the fire protection barriers, which provide fire protection to plant SSCs important to nuclear safety so that safe shutdown can be achieved and maintained. Additionally, fire protection barriers are relied on to minimize the effects of a fire and to prevent the release of radiation to the environment. PINGP is divided into separate fire areas by concrete walls, floors, and ceilings, referred to as principal fire barriers. Openings or penetrations in principal fire barriers that allow passage of personnel, material or SSCs are sealed with fireproofing materials or fire-rated doors to prevent fire from spreading from one area to another. These fire protection barriers are intended to maintain the fire-resistive integrity of the principal barrier. In LRA Table 2.4.5-1, the applicant identifies the components it believes are subject to AMR for the fire protection barriers by component type and intended function. In the first column of LRA Table 3.5.2-5, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.5-1.

2.4.5.2 Conclusion

The staff followed the evaluation methodology discussed in Section 2.4 and reviewed LRA Section 2.4.5, the first three columns of LRA Table 3.5.2-5 and UFSAR Section 10.3 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the fire protection barriers SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.6 Radwaste Building, Old Administration Building, and Administration Building Addition

2.4.6.1 Summary of Technical Information in the Application

LRA Section 2.4.6 describes the radwaste building, old administration building, and the administration building addition. The radwaste building is a concrete and steel framed structure with an insulated metal siding exterior and is supported by mat foundation and perimeter footings. The radwaste building houses radioactive waste handling, treatment, storage, collection and facilities for both units. The radwaste building components such as sumps, dikes, curbs, walls, or vaults are specifically constructed to retain any spilled liquids.

The rectangular steel-framed old administration building with insulated metal siding is part of the original construction and is located adjacent to the north wall of the turbine building with its center portion located immediately above the safety-related reinforced concrete aisle of the turbine building. In order to meet space requirements for offices, storage areas, lockers, etc, a five-story administration building addition with reinforced concrete footings and pier foundations was later constructed. The addition is a U-shaped structure that wraps around the north, east, and west sides of the old administration building.

The applicant identified the radwaste building, old administration building and administration building addition as in-scope of LR based on 10 CFR 54.4(a)(2) criterion since they are located adjacent to the auxiliary and turbine buildings. In LRA Table 2.4.6-1, the applicant identifies the components subject to an AMR for the radwaste building, old administration building, and administration building addition by component type and intended function. In the first column of LRA Table 3.5.2-6, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.6-1.

2.4.6.2 Conclusion

The staff followed the evaluation methodology discussed in Section 2.4 and reviewed LRA Section 2.4.6, the first three columns of LRA Table 3.5.2-6, LR drawing LR-193817, and UFSAR Sections 1.3.2, 1.3.10, 9.2, and 12.2 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the radwaste building, old administration building, and the administration building addition SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.7 Reactor Containment Vessels, Unit 1 and Unit 2

2.4.7.1 Summary of Technical Information in the Application

LRA Section 2.4.7 describes the reactor containment vessels (RCV) for Units 1 and 2, which form the primary containment system. The RCV for each unit is a free-standing, low-leakage steel vessel, including penetrations, isolation systems, and heat removal systems designed to withstand the internal pressure accompanying a loss-of-coolant accident. The RCV consists of steel cylinder walls, a hemispherical dome, and an ellipsoidal bottom. A five-foot wide-annular space between the RCV walls and the shield building walls, and a seven-foot clearance between the top of the vessel and shield building roof dome allows for maintenance and visual inspection of the RCV. The RCV internal structures are, for the most part, conventional reinforced concrete. The concrete forms floor slabs and compartments that support and protect the reactor pressure vessel (RPV) and components associated with engineered safeguards systems, and it provides the primary biological shield for the RPV. The RCV major internal structural components include the reactor/refueling cavity/biological shield wall, the steam generator and pressurizer vaults, the refueling floor, operating floor, the mezzanine floor, and the basement floor. In LRA Table 2.4.7-1, the applicant identifies the components it believes are subject to an AMR for the reactor containment vessels by component type and intended function. In the first column of LRA Table 3.5.2-7, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.7-1.

2.4.7.2 Staff Evaluation

The staff reviewed LRA Section 2.4.7, the first three columns of LRA Table 3.5.2-7, LR drawing LR-19381, UFSAR Sections 5.1, 5.2, 12.2, and 12.3 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 2.4.7 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results, to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The applicant responded to the staff's RAIs as discussed below.

In RAI 2.4.7-1, dated December 1, 2008, the staff noted that in LRA Section 2.4.7, the system function listing under Code RCV-04, "Reactor Containment Vessels and their internal structures provide shielding against high energy line breaks," indicates scoping under 10 CFR 54.4(a)(2) and corresponds to all nonsafety-related systems, structures and components, whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1). The staff further noted that the comment under this item on LRA page 2.4-38 states that, "Reactor Containment Vessels and their internal structures are designed to withstand the effects of high-energy line breaks without loss of function. Reinforced concrete walls and steel structures inside each Reactor Containment Vessel shield safety-related equipment from the effects of an HELB." The staff noted that the above stated structures and structural components are generally safety-related and are in-scope in accordance with 10 CFR 54.4(a)(1), and requested the applicant to address the apparent inconsistency.

In its response, dated December 11, 2008, the applicant stated that 10 CFR 54.4(a)(2), as it applies to Code RCV-04 on page 2.4-38 of the LRA, is used to describe the HELB protection function applicable to certain nonsafety-related concrete and steel structures inside each Reactor Containment Vessel including whip restraints and jet impingement shields whose only function is to provide HELB protection for safety-related equipment. The applicant added that NEI 95-10, Appendix F, Section 3.4 states that:

> "NSR whip restraints, jet impingement shields, blowout panels, etc., that are designed and installed to protect SR equipment from the effects of a HELB, are within the scope of license renewal per 10 CFR 54.4(a)(2)."

The applicant further explained that there are also concrete and steel structures inside the reactor containment vessels that perform an HELB function in combination with safety-related functions such as missile protection and structural support to safety-related components. In an attempt to avoid confusion, the HELB system function was only used to identify nonsafety-related structures whose only function is to provide HELB protection for safety-related equipment. The applicant added that LRA Table 3.5.2-7 provides a list of safety-related concrete and steel structures with multiple functions, one of which is HELB protection.

Based on its review, the staff finds the applicant's response to RAI 2.4.7-1 acceptable because the applicant clarified and explained that 10 CFR 54.4(a)(2), as it applies to Code RCV-04 on page 2.4-38 of the LRA, is only used to describe the HELB protection function applicable to certain nonsafety-related concrete and steel structures such as whip restraints and jet impingement shields inside each Reactor Containment Vessel whose only function is to provide HELB protection for safety-related equipment. Therefore, the staff confirms that 10 CFR 54.4(a)(2) is appropriate for including such nonsafety-related components that perform only an HELB function in-scope of LR. Thus, the staff's concern described in RAI 2.4.7-1 is resolved.

Because of lack of clarity in LRA Tables 2.4.2-1, 2.4.7-1, 3.5.2-2, 3.5.2-7 and the corresponding LRA sections, in RAI 2.4.7-2 dated December 1, 2008, the staff requested the applicant to identify the portions of the LRA that address the scoping, screening and AMR results of structural supports (vertical and lateral, as appropriate) for steam generators, reactor coolant pumps and the reactor vessel included or, if excluded, to justify their exclusion.

In its response to RAI 2.4.7-2, dated December 11, 2008, the applicant stated that supports for the reactor vessels, steam generators, and reactor coolant pumps are identified in the PINGP UFSAR, Section 12.2.4 and Table 12.2-1, as Class 1 structures consistent with Chapter III.B1.1 of NUREG-1801. LRA Table 3.5.2-2 refers to them by the component type, "Support (Class 1 vessels, exchangers, and pumps)." The applicant noted that only the Unit 2 steam generator supports and the Unit 1 and Unit 2 reactor coolant pump supports are installed using high strength bolts; and, therefore, Table 3.5.2-2 specifically identifies these supports for this application. The applicant further clarified that LRA Section 2.4.2 includes a list of in-scope component supports, which includes pressure vessels, heat exchangers, and pumps, and LRA Table 2.4.2-1 combines all in-scope supports under the component heading, "Support."

Based on its review, the staff finds the applicant's response to RAI 2.4.7-2 acceptable because the applicant has confirmed that the structural supports for steam generators, reactor coolant pumps and the reactor vessel are in-scope of LR and subject to an AMR and clarified that they are included as part of the component type "Support" in LRA Table 2.4.2-1 and as part of the component type line items, "Support (members, connections, and anchorage to building structure for Class 1 vessels, exchangers, pumps, valves, piping, insulation and miscellaneous equipment items)" and "Support (high strength bolts for Unit 2 steam generators and Units 1 and 2 reactor coolant pumps)" in LRA Table 3.5.2-2. The staff confirmed that these line items were included in LRA Tables 2.4.2-1 and 3.5.2-2, and that the description in LRA Section 2.4.2 included support members for pumps, heat exchangers and vessels (Reference LRA pages 2.4-10 and 2.4-11), as stated by the applicant. The staff also confirmed that steam generators, reactor coolant pumps and the reactor vessel and their supports are classified as Class 1 in UFSAR Table 12.2. Thus, the staff's concern described in RAI 2.4.7-2 is resolved.

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. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RCVs (Units 1 and 2) SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.8 SBO Yard Structures

2.4.8.1 Summary of Technical Information in the Application

LRA Section 2.4.8 describes the SBO yard structures system that include SSCs that serve a structural function related to supporting certain electrical equipment and conductors required to restore offsite power following an SBO event defined in 10 CFR 50.63. Some of this same equipment is also used to supply offsite power for safe shutdown in response to certain fire scenarios postulated in accordance with 10 CFR 50.48. Offsite power is restored to vital buses in Unit 1 following SBO via the 1R or CT-11 transformers, and to vital buses in Unit 2 via the 2RS or CT-12 transformers.

The substation control house, a steel framed and metal sided single story building supported by a concrete slab and located in the switchyard, houses the electrical controls, metering devices and emergency power sources essential to the operation of the switchyard equipment.

The cooling tower equipment house, a single story concrete block building supported by a concrete slab and located outside of the protected area fence about 400 feet south of the Unit 1 Reactor Building, contains circulating water system electrical equipment as well as equipment used to route electrical power during recovery from a SBO event.

Three transmission towers support the 161 kilo-volt conductors that run from the disconnect in the switchyard to the 1R transformer, which is adjacent to the north side of the turbine building. The 68-foot-high steel towers are supported on concrete piers that extend down to concrete foundation slabs placed on granular soil about 7.5 feet below grade.

Outdoor electrical equipment support structures within the scope of the SBO yard structures system are those that support power transformers, transformer oil tanks, disconnects, breakers, control/metering devices, bus duct and rigid insulators.

The single manhole structure within the scope of the SBO yard structures system is located about 100 feet west of the security building and provides access to splices in the 13.8 kV cables that run from the switchyard to the cooling tower equipment control house. The structure, which has no bottom slab, is a pre-fabricated concrete box founded on granular soil about 8.5 feet below plant grade.

In LRA Table 2.4.8-1, the applicant identifies the components it believes are subject to AMR for the SBO yard structures by component type and intended function. In the first column of LRA

Table 3.5.2-8, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.8-1.

2.4.8.2 Staff Evaluation

The staff reviewed LRA Section 2.4.8, the first three columns of LRA Table 3.5.2-8, LR drawing LR-193817 and UFSAR Section 8 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, the staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted, from the scope of license renewal, any SCs with intended functions, 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 2.4.8, the staff identified an area in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for structures. Therefore, the staff issued an RAI concerning the specific issue, 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 RAI related to LRA Section 2.4.8 and the applicant's response.

In RAI 2.4.8-1, dated December 1, 2008, the staff requested the applicant to state whether if there are any ductbanks and manholes in the yard that are safety-related or important-to-safety or required for regulated events that may be within the scope of license renewal and subject to an AMR, and if so, to provide their scoping, screening and AMR results.

In its response to RAI 2.4.8-1, dated December 11, 2008, the applicant stated that there are no ductbanks in-scope of license renewal, and only one manhole is in-scope of LR and subject to an AMR. The applicant explained that the single manhole, in-scope for the SBO regulated event, is located about 100 feet west of the security building and is described in LRA Section 2.4.8. It provides access to splices in the 13.8 kilo-volt cables that run from the switchyard to the cooling tower equipment house. The applicant stated that LR Boundary drawing LR-193817, entitled, "PINGP Site Layout of the Owner Controlled Area," provides its location (Item 57, coordinate D6). The applicant also stated that LRA Table 2.4.8-1 identified its components as "Concrete" and "Steel Components" and that LRA Table 3.5.2-8 further defines the concrete portion of the structure as "Concrete (cable vault)," and its metal components as "Steel components (miscellaneous structures/equipment items)." The applicant added that aging effects for the manhole structure are managed by the Structures Monitoring Program based on the results of the AMR.

Based on its review, the staff finds the applicant's response to RAI 2.4.8-1 acceptable because the applicant has confirmed that there are no ductbanks that are in-scope of license renewal and clarified that the SCs of the one manhole structure that is in-scope of license renewal, and subject to an AMR, were included as part of line items "Concrete" and "Steel Components" in LRA Table 2.4.8-1. The applicant further clarified that LRA Table 3.5.2-8 further defines the concrete portion of the structure as part of line item "Concrete (cable vault)," and its metal components as part of line item “Steel components (miscellaneous structures/equipment items).” The staff confirms that these line items were included in the stated LRA tables. Therefore, the staff’s concerns described in RAI 2.4.8-1 are resolved.

2.4.8.3 Conclusion

The staff reviewed the LRA, UFSAR, the RAI response, and related structural components 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the SBO 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).

2.4.9 Shield Buildings, Unit 1 and Unit 2

2.4.9.1 Summary of Technical Information in the Application

LRA Section 2.4.9.1 describes shield buildings for Units 1 and 2. The shield building for each unit is a medium leakage conventional reinforced concrete cylinder with a shallow dome roof and a mat foundation. Each shield building encloses the reactor containment vessel, the access openings, the equipment hatch, and that portion of all penetrations that are associated with the primary containment. The annular space between the RCV and the shield building allows for building maintenance and visual inspection of the reactor containment vessel. The mat foundation is common to the reactor containment vessel and also has structural continuity, provided by keyed construction joints, with auxiliary building and turbine building foundations.

Each shield building, with its penetration seals and ventilation system, forms a secondary containment system. Its cylindrical reinforced concrete serves as radiation shielding during normal operation. Following a loss of coolant accident (LOCA), potential fission-product leakage into the annular space between the shield building and reactor containment vessel is captured by the shield building vent system, which continuously filters and recirculates annulus air. Following a LOCA, the shield building’s vent system must be capable of bringing the annulus to a negative pressure with respect to the auxiliary building, and then maintaining a negative pressure. The shield building is primarily a shielding structure and, as such, it is not subjected to the internal pressure loads of the containment pressure vessel.

In LRA Table 2.4.9-1, the applicant identifies the components it believes are subject to AMR for the shielding building (Unit 1 and Unit 2) by component type and intended function. In the first column of LRA Table 3.5.2-9, the staff lists the SCs included within each of the component type groups in LRA Table 2.4.9-1.

2.4.9.2 Conclusion

The staff followed the evaluation methodology discussed in Section 2.4 and reviewed LRA Section 2.4.9, the first three columns of LRA Table 3.5.2-9, LR drawing LR-193817, and UFSAR Sections 5.3, and 12.2 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the shielding building SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.10 Tank Foundations

2.4.10.1 Summary of Technical Information in the Application

LRA Section 2.4.10 describes the tank foundations. There are seven diesel fuel oil storage tanks, supported on reinforced concrete mat foundations, which are directly buried on site, and are used to supply fuel oil to the D1/D2 diesel generators, two diesel driven cooling water pumps, and a diesel-driven fire pump.

Four tanks, supplying fuel to the D1/D2 diesel generators, are buried east of the old service building. Two tanks, supplying fuel oil to the diesel driven cooling water pumps, are buried east of the screenhouse. The remaining tank supplies fuel oil to the diesel-driven fire pump located in the screenhouse.

There are three condensate storage tanks on site and are supported on reinforced concrete slabs on grade. The #11 Unit 1 storage tank is located east of the turbine building, and #21 and #22 Unit 2 storage tanks are located south of the D5/D6 diesel generator building. The condensate storage tanks provide normal and emergency makeup water to the condensate system, and also provide water for the AF system and suction head to the AF pumps.

The fuel oil receiving tank, supported on a raised reinforced concrete foundation surrounded by a concrete dike wall, is the piping design anchor point for one 2" pipe and one 3" pipe that are in-scope of license renewal based on criterion 10 CFR 54.4(a)(2).

In LRA Table 2.4.10-1, the applicant identifies the components subject to AMR for the tank foundations by component type and intended function. In the first column of LRA Table 3.5.2-10, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.10-1.

2.4.10.2 Conclusion

The staff followed the evaluation methodology discussed in Section 2.4 and reviewed LRA Section 2.4.10, the first three columns of LRA Table 3.5.2-10, LR drawing LR-193817 and UFSAR Sections 10.3 and 11.9 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the tank foundation SCs within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.11 Water Control Structures-Approach Canal, Emergency Cooling Water Intake, Intake Canal, and Screenhouse

2.4.11.1 Summary of Technical Information in the Application

LRA Section 2.4.4 describes the water control structures, which include the Approach Canal, the emergency cooling water intake, the intake canal, and the screenhouse.

The Approach Canal is a body of water that extends from the main flow of the Mississippi River to the intake screenhouse and is classified as safety-related. During normal plant operations, the approach canal's primary purpose is to direct water from the Mississippi River to the intake screenhouse located northeast of the powerhouse. During a postulated DBE, the approach canal supplies water to the emergency cooling water intake (ECI) line.

The ECI is a safety-related structure that serves as an inlet to the 36 inch emergency cooling water pipe located in the Approach Canal that runs from the ECI to the screenhouse where it supplies the emergency cooling water bay. The purpose of the ECI is to provide an alternate source of cooling water suction, with the intake canal, for the safety-related cooling water pumps located in the screenhouse needed to maintain safe shutdown of both units after a DBE.

The intake canal is a safety-related body of water that extends from the intake screenhouse located northeast of the powerhouse, to the screenhouse located just north of the powerhouse. The intake canal's primary purpose is to direct water from the Intake screenhouse to the screenhouse to use as a source of plant cooling water. During normal plant operations, the intake canal supplies cooling water suction to the circulating water pumps located in the screenhouse. During a postulated DBE, the intake canal supplies water to the circulating water bays and emergency intake bay located within the screenhouse where it supplies the safety-related cooling water pumps to facilitate plant shutdown.

The screenhouse is a stand-alone reinforced concrete and steel framed structure shared by the two units, and is located north of the turbine-auxiliary-shield building complex. The screenhouse structure provides shelter and protection to several safety-related pumps and associated piping and equipment. Water flows from the intake canal into the screenhouse, past the trash racks and traveling screens, and into the cooling water pump bays.

In LRA Table 2.4.11-1, the applicant identifies the components it believes are subject to an AMR for the water control structures, which include the approach canal, the emergency cooling water intake, the intake canal, and the screenhouse by component type and intended function. In the first column of LRA Table 3.5.2-11, the applicant lists the SCs included within each of the component type groups in LRA Table 2.4.11-1.

2.4.11.2 Staff Evaluation

The staff reviewed LRA Section 2.4.4, the first three columns of LRA Table 3.5.2-11, LR drawing LR-193817, and UFSAR Sections 1.3.2, 1.3.10, 10.4 and 12.2 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, the staff evaluated the structural component functions described in the LRA and 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 2.4.11, the staff identified an area in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for structures. Therefore, the staff issued an RAI concerning the specific issue, 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 RAI related to the LRA Section 2.4.11 and the applicant's response.

In RAI 2.4.11-1, dated December 1, 2008, the staff noted that Section 1.3.2 of the UFSAR states that the plant screenhouse houses the cooling water pumps, fire pumps, circulating water pumps, trash racks and traveling screens. Due to lack of clarity in LRA Tables 2.4.11-1 and 3.5.2-11, the staff requested the applicant to confirm the inclusion or exclusion of the trash racks and traveling screens as structural components within the scope of license renewal and subject to an AMR and accordingly address its scoping, screening and AMR or justify exclusion.

In its response, dated December 11, 2008, the applicant stated that the trash racks and traveling screen support components are in-scope of license renewal, and the aging effects are managed by RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The applicant clarified that LRA Table 2.4.11-1 identifies the components as "Steel Components" and LRA Table 3.5.2-11 further defines the components as "Steel Components (screenhouse trash racks, safeguards traveling screen frames, safeguards bay gates, fasteners)." The applicant further clarified that the traveling screen portion of the screen assembly is active and therefore, does not require an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.4.11-1 acceptable because the applicant has confirmed that trash racks and traveling screen support components are in-scope of license renewal, and subject to an AMR. The applicant clarified that these components are included as part of line item, "Steel Components" in LRA Table 2.4.11-1 and as part of line item, "Steel components (screenhouse trash racks, safeguards traveling screen frames, safeguards bay gates, fasteners)" in LRA Table 3.5.2-11, which the staff confirmed. The staff agrees that the traveling screen portion of the screen assembly is not subject to an AMR since it is an active component. Therefore, the staff's concerns described in RAI 2.4.11-1 are resolved.

2.4.11.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and related structural components 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 SCs subject to an AMR. On the basis of its review, the staff concludes that the applicant has adequately identified the water control structures—approach canal, emergency cooling water intake, intake canal, and screenhouse SCs—within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results: Electrical and Instrumentation and Control Systems

This section documents the staff's review of the applicant's scoping and screening results for electrical and I&C systems. Specifically, this section discusses the following:

- 2.5.1 Cables and Connections (Insulation), includes splices, terminations, fuse blocks and connectors
- 2.5.2 Cables and Connections Used in Instrumentation Circuits (Insulation), sensitive to reduction in conductor insulation resistance
- 2.5.3 Inaccessible Medium Voltage Cables and Connections (Insulation), underground, buried
- 2.5.4 Electrical Connector Contacts (metallic connector pins exposed to borated water)
- 2.5.5 Electrical Penetrations (electrical insulation portions)
- 2.5.6 Metal Enclosed Bus and Connections (Bus/Connections, Enclosure Assemblies, Insulation/Insulators)
- 2.5.7 Fuse Holders (metallic parts), not part of a larger active assembly
- 2.5.8 Cable Connections (metallic parts)
- 2.5.9 Switchyard Bus and Connections
- 2.5.10 Transmission Conductors and Connections
- 2.5.11 High-Voltage Insulators

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

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

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

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

2.5.1 Electrical and Instrumentation and Controls Systems

2.5.1.1 Summary of Technical Information in the Application

LRA Section 2.5 describes the electrical and I&C systems. The scoping method includes all plant electrical and I&C components. Evaluation of electrical systems includes electrical and I&C components in mechanical systems. The default inclusion of plant electrical and I&C systems in the scope of license renewal reflects the method for the integrated plant assessments (IPA) of electrical systems. This method is different from those for mechanical systems and structures.

The basic philosophy of the electrical and I&C components IPA is that components are included in the scoping review unless specifically screened out. The electrical and I&C IPA began by grouping all components into commodity groups of similar electrical and I&C components with common characteristics and by determining component level intended functions of the commodity groups.

The IPA eliminated commodity groups and specific plant systems from further review as the intended functions of commodity groups were examined. In addition to the plant electrical systems, certain switchyard components required to restore offsite power following SBO were included conservatively within the scope of license renewal even though those components are not relied on in safety analyses or plant evaluations for functions that demonstrate compliance with the SBO regulations. The offsite power system evaluation boundaries are described next.

The offsite power system provides the electrical interconnection between PINGP and the offsite transmission network. The offsite power sources required to support SBO recovery actions supply the No.10 transformer, 1R (161 kV) and 2RS (345 kV) transformers as stated in section 2.5 of the April 11, 2008 LRA, Enclosure 1, of the applicant's letter dated May 16, 2008, and the applicant's letter dated December 11, 2008. Specifically, the applicant stated that the offsite power recovery path includes the No.10 transformer, transformers 1R (161 kV) and 2RS (345 kV), the 345 kV and 161 kV switchyard circuit breakers supplying the No.10 transformer, the 1R and 2RS transformers, the circuit breaker-to-transformer and transformer-to-onsite electrical distribution interconnections, control circuits, and structures.

LRA Table 2.5-1 identifies electrical and I&C systems component types within the scope of license renewal and subject to an AMR:

- cable connections (metallic parts)
- electrical cables and connections (insulations), splices, terminations, fuse holders, connectors not subject to 10 CFR 50.49 EQ requirements
- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements in instrumentation circuits
- electrical connections not subject to 10 CFR 50.49 EQ requirements exposed to borated water leakage
- fuse holders - metallic parts
- high-voltage insulators
- inaccessible medium-voltage (2kV to 35kV) cables and connections (e.g., underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements
- metal enclosed bus (non-segregated bus), bus/connections (Units 1, and 2)
- metal enclosed bus (non-segregated bus), enclosure assemblies (Units 1, and 2)
- metal enclosed bus and connections (enclosure assembly-seals)
- electrical penetrations (electrical insulation portions)
- metal enclosed bus (non-segregated bus), insulation/insulators (Units 1, and 2)
- switchyard bus (switchyard bus for SBO recovery) and connections (Units 1, and 2)
- transmission conductors (transmission conductors for SBO recovery path) and connections

The intended functions of the electrical and I&C systems component types within the scope of license renewal include:

- electrical connections to electrical circuit sections for voltage, current, or signal delivery
- electrical conductor insulation and support
- structural or functional support to safety-related equipment

2.5.1.2 Staff Evaluation

The staff reviewed LRA Section 2.5 and Unit 1 and Unit 2 UFSAR Sections 7 and 8 using the evaluation methodology described in Safety Evaluation Report (SER) Section 2.5 and the guidance in SRP-LR Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Controls Systems.”

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

General Design Criterion 17 of 10 CFR Part 50, Appendix A, requires, in part, 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 the following:

> 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 SSCs 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.

In its original application dated April 11, 2008, the applicant described the SBO recovery path that was in the scope of license renewal. The applicant initially stated that the SBO recovery path included all the components and connections from offsite power source including switchyard transformers, high side disconnects, conductors, transformers, buses up to the PINGP Units 1 and 2 safeguards buses. In a letter dated May 16, 2008, the applicant revised the scope of the SBO recovery path to include all components starting from the transmission line breakers, conductors and connections, up to the safeguard buses in both PINGP Units. The staff finds that the revised scope of the SBO recovery path is consistent with the scope of NUREG 1801, Revision 1, and, therefore, is acceptable. In addition, the applicant also revised Section 2.5.10 of the LRA in the May 16, 2008 letter to reflect the revised scope of the SBO recovery path. The staff finds that the revision to Section 2.5.10 of the LRA is consistent with NUREG 1801, Revision 1, and, therefore, is acceptable.

During its review of LRA Section 2.5, the staff identified a need for additional information and therefore issued RAI 2.5 dated November 20, 2008, regarding the inclusion of control circuits of the switchyard circuit breakers (at the transmission voltage) in the scope of license renewal.

In its response, dated December 11, 2008, the applicant stated that the control circuits for the switchyard circuit breaker are included in the scope of license renewal as they are part of the SBO recovery path. The staff finds that the applicant’s response is consistent with NUREG 1801, Revision 1 and therefore is acceptable.

The staff reviewed Section 2.5 of the LRA and determined that further clarification on LRA Section 2.5.4 was warranted to ensure that scope described in this section is consistent with the scope described in NUREG 1801, Revision 1. The staff discussed this point of clarification with the applicant during a teleconference on January 09, 2009 which is described in the applicant's request for additional information response letter dated January 16, 2009.. Regarding LRA Section 2.5.4, the staff had a concern that the wording "metallic connector pins" was too specific and may not fully cover the scope of NUREG 1801, Revision 1. The applicant understood the staff's concern and agreed to revise the "metallic connector pins" to "electrical connector contacts or electrical pin connectors or metallic connector pins" to be consistent with NUREG 1801, Revision 1, and indicated that they will address this change in a formal letter. The staff verified this change by reviewing the applicant's letter dated January 16, 2009, and finds that it is consistent with NUREG 1801, Revision 1, and therefore, is acceptable.

2.5.1.3 Conclusion

The staff reviewed the LRA, UFSAR, and request for additional information responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. In addition, the staff sought to determine whether the applicant failed to identify any components subject to an AMR. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the electrical and I&C systems components within the scope of license renewal consistent with NUREG 1801, Revision 1, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.6 Conclusion for Scoping and Screening

The staff reviewed the information in LRA Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results" and determines that the applicant's scoping and screening methodology was consistent with 10 CFR 54.21(a)(1) and the staff's positions on the treatment of safety-related and nonsafety-related SSCs within the scope of license renewal and on SCs subject to an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

On the basis of its review, the staff concludes, pending resolution of **SER Open Item 2.1.4.1.2-01 (waste gas decay tank)**, 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).

With regard to these matters, except as stated above with respect to the open item, the staff concludes that there is reasonable assurance that the applicant will continue to conduct the activities authorized by the renewed licenses in accordance with the CLB and any changes to the CLB in order to comply with 10 CFR 54.29(a), 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 Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, by the staff of the U.S. Nuclear Regulatory Commission (NRC)/(the staff). In Appendix B of its license renewal application (LRA), Northern States Power, a Minnesota Corporation (NSPM or the applicant) described the 43 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," (the 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 the following: (1) systems, structures, and components (SSCs), (2) SC materials, (3) environments to which the SCs are exposed, (4) the aging effects of the materials and environments, (5) the AMPs credited with managing or monitoring the aging effects, and (6) recommendations for further applicant evaluations of aging management for certain component types.

To determine whether use of the GALL Report would improve the efficiency of LRA review, the staff conducted a demonstration of the GALL Report process in order to model the format and content of safety evaluations based on it. The results of the demonstration project confirmed that the GALL Report process will improve the efficiency and effectiveness of LRA review while maintaining the staff's focus on public health and safety. NUREG-1800, Revision 1, "Standard

Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated September 2005, was prepared based on both the GALL Report model and lessons learned from the demonstration project.

The staff's review was in accordance with Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR Part 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," and the guidance of the SRP-LR and the GALL Report.

In addition to its review of the LRA, the staff conducted an on-site audit of selected AMRs and associated AMPs, during the week of September 08, 2008. The onsite audits and reviews are designed for maximum efficiency of the staff's LRA review. The applicant can respond to questions, the staff can readily evaluate the applicant's responses, the need for formal correspondence between the staff and the applicant is reduced, and the result is an improvement in review efficiency.

3.0.1 Format of the License Renewal Application

The applicant submitted an application that follows the standard LRA format agreed to by the staff and the Nuclear Energy Institute (NEI) by letter dated April 7, 2003 (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 PINGP application is essentially the same. The intent of the revised format of the PINGP 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 programs in 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 the information’s location
- the name of a plant-specific program
- exceptions to GALL Report assumptions
- discussion of how the line is consistent with the corresponding line item in the GALL Report when the consistency may not be obvious
- discussion of how the item is different from the corresponding line item in the GALL Report (e.g., when an exception is taken to a GALL AMP)

The format of each Table 1 allows the staff to align a specific row in the table with the corresponding GALL Report table row so that the consistency can be checked easily.

3.0.1.2 Overview of Table 2s

Each Table 2 provides the detailed results of the AMRs for components identified in LRA Section 2 as subject to an AMR. The LRA has a Table 2 for each of the systems or structures within a specific system grouping (e.g., RCS, engineered safety features (ESF), auxiliary systems, etc.). For example, the ESF group has tables specific to the containment spray system, containment isolation system, and emergency core cooling system. Each Table 2 consists of nine columns:

- Component Type – The first column lists LRA Section 2 component types subject to an AMR in alphabetical order.
- Intended Function – The second column identifies the license renewal intended functions, 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, 3.0-2, and 3.0-3.
- Aging Effect Requiring Management – The fifth column lists aging effects requiring management (AERMs). As part of the AMR process, the applicant determined any AERMs for each combination of material and environment.
- AMPs – The sixth column lists the AMPs that the applicant uses to manage the identified aging effects.
- NUREG-1801 Vol. 2 Item – The seventh column lists the GALL Report item(s) identified in the LRA as similar to the AMR results. The applicant compared each combination of component type, material, environment, AERM, and AMP in LRA Table 2 with the GALL Report items. If there are no corresponding items in the GALL Report, the applicant

leaves the column blank in order to identify the AMR results in the LRA tables corresponding to the items in the GALL Report tables.

- Table 1 Item – The eighth column lists the corresponding summary item number from LRA Table 1. If the applicant identifies in each LRA Table 2 AMR results consistent with the GALL Report, the Table 1 line item summary number should be listed in LRA Table 2. If there is no corresponding item in the GALL Report, column eight is left blank. In this manner, the information from the two tables can be correlated.
- Notes – The ninth column lists the corresponding notes used to identify how the information in each Table 2 aligns with the information in the GALL Report. The notes, identified by letters, were developed by an NEI work group and will be used in future LRAs. Any plant-specific notes identified by numbers provide additional information about the consistency of the line item with the GALL Report.

3.0.2 Staff's Review Process

The staff conducted three types of evaluations of the AMRs and AMPs.

(1) For items that the applicant stated were consistent with the GALL Report, the staff conducted either an audit or a technical review to determine consistency.

(2) For items that the applicant stated were consistent with the GALL Report with exceptions, enhancements, or both, the staff conducted either an audit or a technical review of the item to determine consistency. In addition, the staff conducted either an audit or a technical review of the applicant's technical justifications for the exceptions or the adequacy of the enhancements.

The SRP-LR states that an applicant may take one or more exceptions to specific GALL AMP elements; however, any deviation from or exception to the GALL AMP should be described and justified. Therefore, the staff considers exceptions as being portions of the GALL AMP that the applicant does not intend to implement.

In some cases, an applicant may choose an existing plant program to address aging effects 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.

The staff used audits and technical reviews of the applicant's AMPs and AMRs to determine whether the aging effects on SCs can be adequately managed to maintain their intended function(s) consistent with the plant's Current Licensing Bias (CLB) for the period of extended operation, as required by 10 CFR Part 54.

3.0.2.1 Review of AMPs

For AMPs for which the applicant claimed consistency with the GALL AMPs, the staff conducted either an audit or a technical review to verify the claim. For each AMP with one or more deviations, the staff evaluated each deviation to determine whether the deviation was acceptable and whether the modified AMP would adequately manage the aging effect(s) for which it was credited. For AMPs not evaluated in the GALL Report, the staff performed a full review to determine their adequacy. The staff evaluated the AMPs against the following 10 program elements defined in SRP-LR Appendix A.

(1) Scope of the Program – Scope of the program should include the specific SCs subject to an AMR for license renewal.

(2) Preventive Actions – Preventive actions should prevent or mitigate aging degradation.

(3) Parameters Monitored or Inspected – Parameters monitored or inspected should be linked to the degradation of the particular structure or component intended function(s).

(4) Detection of Aging Effects – Detection of aging effects should occur before there is a loss of structure or component intended function(s). This includes aspects such as method or technique (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.

(5) Monitoring and Trending – Monitoring and trending should predict the extent of degradation, as well as provide or allow for timely corrective or mitigative actions.

(6) Acceptance Criteria – 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.

The staff completed an independent review of the applicant's operating experience (OE) cited in the LRA to evaluate the incorporation of site specific and industry OE into PINGP AMPs. In addition the inspection staff from Region III completed additional reviews of OE as part of their license renewal scoping, screening and aging management review documented in Inspection Report 05000282/2009006 and 05000306/2009006.

Operating experience plays an important role in license renewal and figures prominently in a applicant's renewal application. The SRP-LR provides guidance to the NRC staff on assessing the 10 program elements for each aging management program submitted in a license renewal application. OE is listed as one of these elements, and defined in the GALL Report.

Operating experience is also an important part of two other aging management program elements: specifically, detection of aging effects, and monitoring and trending. The SRP also calls attention to the importance of the applicants plant-specific OE in relation to scoping and screening, aging management review, and time-limited aging analysis activities (TLAA).

During the aging management audit at PINGP, the staff reviewed samples of the applicant's condition reports and interviewed site staff personnel to independently verify that the applicant adequately incorporated OE into the respective AMP as appropriate. Specific cases of these reviews are described in the associated AMP evaluations by the staff. Details of the staff's audit evaluation of program elements (1) through (6) and (10) are documented in SER Section 3.0.3.

The staff reviewed the applicant's QA program and documented its evaluations in SER Section 3.0.4. The staff's evaluation of the QA program included assessment of the "corrective actions," "confirmation process," and "administrative controls" program elements.

3.0.2.2 Review of AMR Results

Each LRA Table 2 contains information concerning whether or not the AMRs identified by the applicant align with the GALL Report AMRs. For a given AMR in a Table 2, the staff reviewed the intended function, material, environment, AERM, and AMP combination for a particular system component type. Item numbers in column seven of the LRA, "NUREG-1801 Vol. 2 Item," correlate to an AMR combination as identified in the GALL Report. The staff also conducted on-site 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 on-site audit, the staff also examined the applicant's justifications to verify that the applicant's activities and programs will adequately manage the effects of aging on SCs. The staff also conducted detailed discussions and interviews with the applicant's license renewal project personnel and others with technical expertise relevant to aging management. The staff's audit activities are documented in the Audit Report (ADAMS Accession No. ML090850009)

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 systems or structures 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 PINGP Aging Management Programs

PINGP 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
10 CFR 50, Appendix J (B2.1.1)	Existing	Consistent	XI.S4	structures and component supports	3.0.3.1.1
Aboveground Steel Tanks (B2.1.2)	New	Consistent	XI.M29	auxiliary systems / steam and power conversion systems	3.0.3.1.2
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.3)	Existing	Consistent	XI.M1	reactor vessel, internals and reactor coolant system	3.0.3.1.3
ASME Section XI, IWE (B2.1.4)	Existing	Consistent	XI.S1	structures and component supports	3.0.3.1.4
ASME Section XI, IWF (B2.1.5)	Existing	Consistent	XI.S3	structures and component supports	3.0.3.1.5
Bolting Integrity (B2.1.6)	Existing	Consistent with exception and enhancement	XI.M18	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.2.1
Boric Acid Corrosion (B2.1.7)	Existing	Consistent	XI.M10	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems / structures and component supports	3.0.3.1.6

PINGP 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
Buried Piping and Tanks Inspection (B2.1.8)	New	Consistent	XI.M34	engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.1.7
Closed-Cycle Cooling Water System (B2.1.9)	Existing	Consistent with exceptions and enhancement	XI.M21	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems	3.0.3.2.2
Compressed Air Monitoring (B2.1.10)	Existing	Consistent with exceptions and enhancements	XI.M24	auxiliary systems	3.0.3.2.3
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.11)	New	Consistent with exceptions	XI.E6	electrical and instrumentation and controls	3.0.3.2.4
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.12)	New	Consistent	XI.E1	electrical and instrumentation and controls	3.0.3.1.8
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B2.1.13)	New	Consistent	XI.E2	electrical and instrumentation and controls	3.0.3.1.9
External Surface Monitoring (B2.1.14)	Existing	Consistent with enhancements	X.M36	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems / structures and component supports	3.0.3.2.5

PINGP 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
Fire Protection (B2.1.15)	Existing	Consistent with exception and enhancements	XI.M26	auxiliary systems	3.0.3.2.6
Fire Water System (B2.1.16)	Existing	Consistent with enhancement	XI.M27	auxiliary systems	3.0.3.2.7
Flow-Accelerated Corrosion (B2.1.17)	Existing	Consistent with exception	XI.M17	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.1.10
Flux Thimble Tube Inspection (B2.1.18)	Existing	Consistent with enhancement	XI.M37	reactor vessel, internals and reactor coolant system	3.0.3.2.8
Fuel Oil Chemistry (B2.1.19)	Existing	Consistent with exception and enhancement	XI.M30	auxiliary systems	3.0.3.2.9
Fuse Holders (B2.1.20)	New	Consistent	XI.E5	electrical and instrumentation and controls	3.0.3.1.11
Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.21)	New	Consistent	XI.E3	electrical and instrumentation and controls	3.0.3.1.12
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B21.1.22)	New	Consistent	XI.M38	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems / structures and component supports	3.0.3.1.13
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.23)	Existing	Consistent with enhancement	XI.M23	structures and component supports	3.0.3.2.10

PINGP 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
Lubricating Oil Analysis (B2.1.24)	Existing	Consistent	XI.M39	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.1.14
Masonry Wall (B2.1.25)	Existing	Consistent	XI.S5	structures and component supports	3.0.3.1.15
Metal-Enclosed Bus (B2.1.26)	New	Consistent	XI.E4	electrical and instrumentation and controls	3.0.3.1.16
Nickel-Alloy Nozzles and Penetrations (B2.1.27)	New	Consistent	XI.M11	reactor vessel, internals and reactor coolant system	3.0.3.1.17 and 3.0.3.3.1
Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (B2.1.28)	Existing	Consistent with enhancement	XI.M11A	reactor vessel, internals and reactor coolant system	3.0.3.2.11
One-Time Inspection (B2.1.29)	New	Consistent	XI.M32	engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.1.18
One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.30)	New	Consistent	XI.M35	reactor vessel, internals and reactor coolant system	3.0.3.1.19
Open-Cycle Cooling Water System (B2.31)	Existing	Consistent	XI.M20	auxiliary systems	3.0.3.1.20
Protective Coating Monitoring and Maintenance Program	Existing	Consistent	XI.S8	structures and component supports	3.0.3.1.24
PWR Vessel Internals (B2.1.32)	Existing	Consistent	XI.M16	reactor vessel, internals and reactor coolant system	3.0.3.1.21
Reactor Head Closure Studs (B2.1.33)	Existing	Consistent with enhancement	XI.M3	reactor vessel, internals and reactor coolant system	3.0.3.2.12

PINGP 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
Reactor Vessel Surveillance (B2.1.34)	Existing	Consistent with enhancement	XI.M31	reactor vessel, internals and reactor coolant system	3.0.3.2.13
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.35)	Existing	Consistent with enhancement	XI.S7	structures and component supports	3.0.3.2.14
Selective Leaching of Materials (B2.1.36)	New	Consistent with exception	XI.M33	auxiliary systems / steam and power conversion systems	3.0.3.2.15
Steam Generator Tube Integrity (B2.1.37)	Existing	Consistent with exception	XI.M19	reactor vessel, internals and reactor coolant system	3.0.3.2.16
Structures Monitoring (B2.1.38)	Existing	Consistent with enhancement	XI.S6	structures and component supports	3.0.3.2.17
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (B2.1.39)	New	Consistent	XI.M12	reactor vessel, internals and reactor coolant system	3.0.3.1.22
Water Chemistry (B2.1.40)	Existing	Consistent with exception and enhancement	XI.M2	reactor vessel, internals and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems / structures and component supports	3.0.3.2.18
Environmental Qualification (EQ) of Electrical Components (B3.1)	Existing	Consistent	X.E1	electrical and instrumentation and controls	3.0.3.1.23
Metal Fatigue of Reactor Coolant Pressure Boundary (B3.2)	Existing	Consistent with enhancement	X.M1	reactor vessel, internals and reactor coolant system	3.0.3.2.19

3.0.3.1 AMPs Consistent with the GALL Report

In LRA Appendix B, the applicant identified the following AMPs as consistent with the GALL Report:

- 10 CFR Part 50, Appendix J Program
- Aboveground Steel Tanks Program
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- ASME Section XI, Subsection IWE Program
- ASME Section XI, Subsection IWF Program
- Boric Acid Corrosion Program
- Buried Piping and Tanks Inspection Program
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program
- Flow-Accelerated Corrosion Program[1]
- Fuse Holders Program
- Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Lubricating Oil Analysis Program
- Masonry Walls Program
- Metal-Enclosed Bus Program
- Nickel-Alloy Nozzles and Penetrations Program
- One-Time Inspection Program
- One-Time Inspection of ASME Code Class 1 Small Bore Piping Program
- Open-Cycle Cooling Water System Program
- PWR Vessel Internals Program
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program
- Environmental Qualification (EQ) of Electrical Components Program
- Protective Coating Monitoring and Maintenance Program

[1]: In a letter dated March 12, 2009, the applicant amended its Flow-Accelerated Corrosion Program to comply with the latest EPRI guidance. The amended AMP is consistent with an exception to the GALL Report.

3.0.3.1.1 10 CFR Part 50, Appendix J

Summary of Technical Information in the Application. LRA Section B2.1.1 describes the existing 10 CFR Part 50, Appendix J Program as consistent with GALL AMP XI.S4, "10 CFR 50, Appendix J." The applicant stated leak rate tests assure that leakage through the primary containment and systems and components penetrating primary containment does not exceed allowable values as specified in the Technical Specifications. The applicant further stated that periodic surveillance of reactor containment penetration and isolation valves is performed so that proper maintenance and repairs are made. The applicant uses Option B, the performance-based approach, to implement the requirement of containment leak rate monitoring and testing.

Staff Evaluation. During its audit, the staff interviewed the applicant's technical staff and reviewed the applicant's claim of consistency with the GALL Report. The staff audited the 10 CFR Part 50, Appendix J Program on-site basis documents to determine their consistency with GALL AMP XI.S4. Specifically, the staff reviewed the program elements and associated on-site documents and found that they are consistent with GALL AMP XI.S4. On the basis of its review, the staff finds the applicant's 10 CFR Part 50, Appendix J Program consistent with the program elements of GALL AMP XI.S4, and therefore acceptable.

Operating Experience. The staff also reviewed the operating experience (OE) described in LRA Section B2.1.1. The applicant stated that PINGP has experienced significant leakage through airlock door operating shaft seals, which was resolved by replacing the seals with a type less susceptible to leakage, and performing more frequent tests. The applicant further stated that other issues such as valve degradation and airlock seal damage have been addressed through routine maintenance. During the audit, the staff found that the significant leakage was discovered through the Unit 2 maintenance airlock door operating shaft seals during a Type B test in 1989. The staff reviewed historic test data for the particular airlock, which showed that repairs successfully addressed the leak, although leak rates remained relatively high until 2002. During this review the staff also found that the Type B & C allowable leak rates since 1998 were changed from 154,800 to 43,331 cc/min on the provided surveillance procedures. In RAI B2.1.1-1 dated November 5, 2008, the staff requested that the applicant address the time between initial discovery and successful repair of the maintenance airlock door leak as well as the change in the allowable leak rates.

In its response dated December 5, 2008, the applicant addressed RAI B2.1.1-1. The applicant explained that prior to December 2000, the maintenance airlock seals consisted of mechanical seals or a packing arrangement. The mechanical seals were not very tolerant of shaft misalignment, while the packing arrangement was difficult to inspect and maintain due to cramped working conditions. The applicant further explained that in December 2000 a new airlock shaft seal design was approved by the PINGP modification process and installed. The new design utilizes O-rings and allows for a greater amount of misalignment and does not require routine maintenance. The applicant also explained that the Type B & C allowable leak rates were reduced due to excessive control room in-leakage during testing. The lower containment leak rate was the value used in the LOCA control room dose evaluation, which became the limiting value when the control room seals were found to be faulty. This lower value was used until the control room seals were repaired or replaced and the control room in-leakage was shown to be at acceptable levels. Once the in-leakage was reduced to acceptable levels, the containment leakage acceptance criteria was returned to the original value of 154,800 cc/min. Based on its review, the staff finds the applicant's response to RAI B2.1.1-1 acceptable because it adequately explains the improvement in leak rates that occurred in 2002, as well as the high leak rates between 1989 and 2002. The response also explains the reduction in the Type B & C allowable leak rates. The staff's concerns described in RAI B2.1.1-1 are resolved. The staff did not identify any age-related related issues not bounded by the industry OE.

On the basis of its review and the applicant's response to RAI B2.1.1-1, 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 A2.1, the applicant provided the UFSAR supplement for the 10 CFR Part 50, Appendix J Program. The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's 10 CFR Part 50, Appendix J Program, including the applicant's response to RAI B2.1.1-1, 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.

3.0.3.1.2 Aboveground Steel Tanks

Summary of Technical Information in the Application. LRA Section B2.1.2 describes the new Aboveground Steel Tanks Program as consistent with GALL AMP XI.M29 "Aboveground Steel Tanks." The applicant has credited this program for managing the aging effect of loss of material for carbon steel tanks that rest on either soil or concrete that are in-scope. The applicant further stated that a visual inspection will be utilized for the external surfaces of the tanks until the contact of the tank wall with the foundation and a ultrasonic test will be performed on the tank bottom to determine if there is significant degradation on the inaccessible surface of the tank bottom. The applicant also stated that this program will provide for inspection of those outdoor tanks that are fully covered by insulation by periodically removing insulation to perform a direct inspection of the tank exterior wall.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff's summary of its on-site review of AMP B2.1.2, Aboveground Steel Tanks Program, is documented in staff's Audit Summary Report Section for this AMP.

In comparing the seven program elements in the applicant's program to those in GALL AMP XI.M29, the staff noted that the program elements in which 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.M29.

During the audit, the staff noted that in the applicant's program basis document under the program element, "monitoring and trending," the applicant discussed that the inspection frequency for the visual inspection of the accessible external tank surface will be performed at least once per refueling cycle. The staff noted that this is consistent with the recommendations provided in GALL AMP XI.M29; however, the staff determined that additional information was needed regarding the inspection frequency of the inaccessible surfaces of the carbon steel tanks (i.e. tank bottoms) and of the tank exteriors of those outdoor carbon steel tanks that are fully insulated. The staff also noted that the applicant stated in its program basis document that the inspection scope and frequency will be adjusted based on the results of the previous inspections and OE. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.2-1 requesting the applicant clarify the following:

(a) clarify the inspection frequency for the inaccessible surfaces (tank bottoms) of the tanks in the scope of this program;

(b) clarify the inspection frequency for the tank exterior of the insulated tanks that require the periodic removal of the insulation near the bottom of the tanks; and

(c) clarify and justify the number of inspections that will be performed on the external (accessible) surfaces, the inaccessible surfaces (tank bottoms), and the tank exteriors that require removal of insulation in-scope of this program, before the inspection scope/frequency will be adjusted.

The applicant responded to RAI B2.1.2-1 by letter dated December 5, 2008. The applicant stated in its response to part (a) that this program will include a one-time inspection of the inaccessible surfaces (tank bottoms) of one of the three condensate storage tanks CSTs within the 10-year period prior to entering the period of extended operation. The applicant further stated that an ultrasonic inspection technique will be utilized to ensure that degradation is not occurring on the external surface of the tank bottom. The staff noted that based on the inspection results that any indications or relevant conditions of degradation will be compared to the tank design thickness and corrosion allowance. The staff further noted that the applicant may perform additional inspections on the three CSTs based on the plant-specific inspection results and industry experience. The staff also noted that the applicant's approach of a one-time inspection of the inaccessible tank surface is consistent with the recommendations of the program element, "monitoring and trending," of GALL AMP XI.M29. On the basis of its review, the staff finds the applicant's response acceptable because the applicant indicated the inspection of the inaccessible surfaces of the tanks in the scope of the program will entail a one-time inspection of the surfaces, which is consistent with the "monitoring and trending" program element recommendations provided in GALL AMP XI.M29.

The applicant stated in its response to part (b) that the entire exterior surface of the insulation for the insulated tanks will be inspected visually at least once per refueling cycle. The staff noted that the recommendations provided in the "monitoring and trending" program element of GALL AMP XI.M29 states in part that "plant system walkdowns during each outage provide for timely detection of aging effects." The applicant stated this inspection will identify damage to the insulation or its outer covering that would allow water to penetrate and for discoloration or other signs that the insulation has been wetted. The applicant further stated that sample sections of the insulation near the bottom of these tanks (i.e., locations of highest potential for wetted insulation) will be removed from one of the three CSTs once per refueling cycle, to allow for direct inspection of the exterior of the tank. The staff noted that results from these inspections will be evaluated to determine if additional direct visual inspections are required in order to ensure there is adequate aging management. On the basis of its review, the staff finds the applicant's response and aging management basis for visual examinations to be acceptable because of the following: (1) the applicant will be performing its visual inspections at least once per refueling cycle of the exterior surface of the insulation for these tanks, consistent with the recommendations of GALL AMP XI.M29; (2) the applicant will be removing sample sections of the insulation from the tank surfaces in those areas considered to have the highest potential for wetting; (3) the visual examinations are capable of detecting cracking or loss of material that breaks the exterior surfaces of the tank bottoms; and (4) the removal of the insulation in these areas will provide access for direct visual inspection of the tank exterior surfaces, which will preclude the insulation from concealing any evidence of corrosion on the external tank surfaces.

The applicant stated in its response to part (c) that the tanks in the scope of this program will be inspected at intervals that will detect loss of material due to corrosion and will be managed such that the components will be capable of performing their intended functions during the period of extended operation. The staff noted that two pre-coat slurry tanks were removed from the scope of this program because these tanks are normally dry and are only used during refueling outages and thus do not meet the criteria in 10 CFR 54.4(a)(1), (2) or (3). The staff further noted that the three insulated CSTs are the only tanks within the scope of this program, and as stated previously by the applicant, a visual inspection of the exterior insulation of these tanks will be performed at least once per refueling cycle, which is consistent with the recommendations provided in GALL AMP XI.M29, and sample sections of the insulation will be removed to facilitate direct visual inspection of the tank exterior surfaces. The staff's evaluation of the inspection frequency for the inaccessible surfaces is discussed in part (a) of the applicant's response to RAI B2.1.2-1. The applicant further stated that the inspection frequency may be adjusted as needed based on plant-specific inspection results and industry OE. The staff noted that applicant's proposal to adjust the inspection frequency is consistent with recommendations provided in the GALL Report. The staff further noted that if inspection results indicate that corrosion is occurring, this will be entered into the applicant's corrective actions program to determine further service, adequacy of current inspection frequency and required corrective actions. On the basis of its review, the staff finds the applicant's response acceptable because (1) the applicant will be performing its visual inspections at least once per refueling cycle of the exterior surface of the insulation for these tanks, consistent with the recommendations of GALL AMP XI.M29; (2) the applicant will be removing sample sections of the insulation with the highest potential for wetting to allow for direct visual inspection of the tank exterior, which will be capable of detecting any corrosion or degradation behind the insulation; and (3) the applicant's proposal to adjust the inspection frequency is consistent with the recommendations in the GALL Report.

The staff noted that the Aboveground Steel Tanks Program includes LRA Commitment No. 3, which was placed on the LRA in the applicant's letter of January 20, 2009, and in which the applicant committed to implementing this program prior to entering the period of extended operation. The staff finds this commitment to be acceptable because the applicant's commitment to implement the program prior to the period of extended operation satisfies the staff's implementation time-frame statement for LRA commitments in SRP-LR Section 3.0.1.

On the basis of its review, as discussed above, the staff finds the applicant's response to RAI B2.1.2-1 and the applicant's basis for inspecting these tanks, as committed to in LRA

Commitment No. 3 to be acceptable because the aging management basis is consistent with the program elements of GALL AMP XI.M29. RAI B.2.1.2-1 is resolved.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.2, the applicant's condition reports (CRs) during the on-site audit and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. During its review of the applicant's OE the staff noted that during a periodic structures inspection performed by the applicant in 2007, corrosion on the covering of the insulation and coating degradation on the hatch covers was discovered. The staff noted that this degradation was located on the accessible exterior surface of the outdoor CSTs. As a result of the inspection findings, the applicant stated that it entered its discovery into its corrective actions program. The applicant also issued action reports (ARs) and work requests in order to address these issues of degradation. The staff noted that the applicant was able to detect degradation on the aboveground steel tank with a visual inspection during a routine structures inspection prior to the loss of intended functions of the tanks and the applicant has taken appropriate measure to have the degradation repaired and the work is currently in the planning stages, as part of PINGP's corrective actions.

The staff confirmed that the applicant has taken appropriate corrective actions for the OE that is applicable to the Aboveground Steel Tanks Program and noted that there were not any aging effects or age-related degradation that could not be detected in accordance with the AMPs' inspection methods or that are not bounded by the ability of the AMP to detect the aging effects. 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; therefore, the staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A2.2 the applicant provided the UFSAR supplement for the Aboveground Steel Tanks Program. The staff reviewed the supplement and verified that, in LRA Commitment No. 3 of the Preliminary License Renewal Commitments in letter dated January 9, 2009, the applicant committed to implementing this program prior to the period of extended operation as described in LRA Section B2.1.2. The staff finds the UFSAR supplement for this AMP 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, as committed to in LRA Commitment No. 3. 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 Aboveground Steel Tanks 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).

3.0.3.1.3 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

Summary of Technical Information in the Application. LRA Section B2.1.3 describes the applicant's existing American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. The applicant stated that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides for condition monitoring of ASME Class 1, 2 and 3 pressure-retaining components, their welded integral attachments, and bolting. The program is implemented in accordance with the requirements of 10 CFR 50.55a, with specified limitations, modifications and NRC-approved alternatives, and utilizes ASME Section XI, Subsections IWB, IWC, and IWD. The program includes periodic visual, surface, and/or volumetric examinations and leakage tests of Class 1, 2, and 3 pressure-retaining components, their welded integral attachments, and bolting.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, and determined that it is adequate to manage the aging effects for which the LRA credits it.

LRA Section B2.1.3 provides the program description, statement of consistency with the GALL Report, OE, and the conclusion that the PINGP Inservice Inspection program will provide reasonable assurance that aging effects will be adequately managed through the period of extended operation. The applicant stated that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is consistent with the recommendations of aging management program (AMP) XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," with no exceptions or enhancements.

During the on-site review, the staff reviewed documents supporting the applicant's conclusion that the program elements are consistent with the elements in the GALL AMP. The staff noted that where the applicant claimed the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to be consistent with elements of the GALL AMP XI.M1, the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program elements are consistent with the GALL AMP XI.M1. However, in LRA Appendix B2.1.3, the applicant describes the present Inservice Inspection (ISI) program, approved by the staff for the fourth ISI interval, which utilizes 1998 Edition of the ASME Code Section XI, Subsections IWB, IWC, and IWD, inclusive of the 2000 Addenda. Therefore, specified limitations, modifications and NRC-approved alternatives described in Appendix B2.1.3 only apply to the fourth ISI interval. The LRA does not state how the ISI program will be implemented during the period of extended operation. The staff issued RAI B2.1.3-1 dated December 5, 2008 asking the applicant to describe how the ISI program will be implemented during the period of extended operation.

In a letter dated December 18, 2008, the applicant responded to RAI B2.1.3-1 stating that future inspection intervals will be in accordance with 10 CFR 50.55a and that all relief requests will be submitted to the staff for approval. Therefore, the staff finds that future inspection intervals are acceptable because the applicant will implement inspections in accordance with (1) applicable regulations and (2) NRC approved ASME Code cases and relief requests. In addition, this is in compliance with the requirements in 10 CFR 50.55a.

The staff noted that, in its final statement of consideration (SOC) on the updates of 10 CFR 50.55a, “codes and standards” (Federal Register (FR) Volume 73, No. 176, pages 52730 – 52750), the staff mandated new augmented inspection requirements for upper reactor vessel closure head (RVCH) penetration nozzles that are made from nickel alloy materials or that are structurally welded to the upper RVCH using bimetallic (i.e., nickel alloy) weld filler metals. For these components, the updated rule imposed: (1) new augmented non-visual inspection methods for the components in accordance with the methods and criteria in ASME Code Case N-729-1, as defined, referenced and subject to the limitations in 10 CFR 50.55a(g)(6)(ii)(D), and (2) new augmented bare metal visual examinations requirements in accordance with the methods and criteria in ASME Code Case N-722, as defined, referenced and subject to the limitations in 10 CFR 50.55a(g)(6)(ii)(E). The referenced SOC makes the following statement with respect to PWR applicants whose LRAs include AMPs corresponding to GALL AMP XI.M-11A and whose LRAs are currently under review:

“For new or current license renewal applicants, they may reference conformance GALL AMP XI.M11A and compliance with the augmented inspection requirements in paragraphs 10 CFR 50.55a(g)(6)(ii)(D) and (E) without the need for taking an exception to the program elements in GALL AMP XI.M11A.”

In its final statement of consideration (SOC) on the updates of 10 CFR 50.55a, the staff also mandated new augmented inspection requirements for partial or full penetration welds in Class 1 components fabricated with Alloy 600/82/182 material pressure boundary leakage in pressurized water reactor (PWR) plants. For these components, the updated rule imposed augmentation of the applicant’s Inservice Inspection Program (ISI) program by implementing the visual inspection methods of ASME Code Case N-722 subject to the limitations in 10 CFR 50.55a(g)(6)(ii)(E).

The staff noted that in Commitment No. 1, the applicant committed to submit amendments to the PINGP LRA (including any changes to the UFSAR supplements and Commitment List for the LRA) pursuant to the LRA update requirements in 10 CFR 54.21(b), which requires that each year following submittal of the LRA and at least three months before scheduled completion of the NRC review, an amendment to the LRA be submitted that identifies any change to the CLB of the facility that materially affects the contents of the LRA, including the Updated Final Safety Analysis Report (UFSAR) supplement. Based on the applicant’s Commitment No. 1, the staff finds the applicant will implement the new mandated augmented inspection requirements in 10 CFR 50.55a(g)(6)(ii)(D) and (E).

The applicant’s ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3) states that the provisions of ASME Section XI are augmented by additional inspections to detect general and pitting corrosion on the shell to transition cone weld of the Westinghouse Model 51 steam generators in Unit 2. Westinghouse Model 51 steam generators have a high stress region at the shell to transition cone weld, and corrosion of the steam generator shell is known to exist. The staff noted that the inspection method was not identified in the applicant’s AMP. During discussions between the staff and the applicant, the applicant stated that the visual inspection of the interior of the transition cone weld is performed for each ISI interval. The staff finds visual inspection of the interior circumference of the transition cone weld an acceptable method to detect degradation as recommended by Information Notice No. 90-04, "Cracking of the Upper Shell-to-Cone Girth Welds in Steam Generators.

Based on its review, the staff finds the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program consistent with the program elements of GALL AMP XI.M1, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.3. The applicant stated that Implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides reasonable assurance that aging effects will be managed such that structures, systems, and components within the scope of this program will continue to perform their intended function(s) during the period of extended operation and OE indicates the IWB, IWC, and IWD Program is effective in monitoring and detecting degradation and taking effective corrective actions as needed when acceptance criteria are not met.

The staff audited the OE reports and interviewed the applicant's technical staff. During review of LRA B2.1.3, "Operating Experience" the staff noted that there were two cracking instances due to intergranular stress corrosion cracking (IGSCC) of Safety Injection Accumulator Tanks. Cracks were repaired and augmented inspection procedures were implemented as follows:

(1) safety injection accumulator tank nozzles will be examined on a 10-year frequency, and

(2) procedures were developed to perform external ultrasonic examination (UT) examinations and internal visual and dye penetrant examinations of safety injection accumulators.

The staff noted that the documentation provided by the applicant during the onsite review supports the applicant's statements, regarding OE and confirmed that the plant-specific OE did not reveal any degradation not bounded by industry experience. The staff finds that the ability of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to detect cracking in the safety injection accumulators and the applicant's adjustment of this AMP to perform augmented UT, visual and dye penetration inspections of the accumulators provides objective evidence that supports the conclusion that the AMP will manage the effects of aging during the period of extended operation in accordance with SRP-LR Appendix A, Section A.1.2.3.10. Based on this determination, the staff finds this program element acceptable.

UFSAR Supplement. In LRA, Appendix A, Section A2.3, the applicant provided its UFSAR Supplement for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. The staff verified that provisions of the UFSAR Supplement are in accordance with SRP-LR, Table 3.1-2, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD. The staff noted that the UFSAR Supplement includes provisions to augment the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to inspect the Unit 2 Westinghouse Model 51 steam generators for pitting and general corrosion of the transition cone welds. The staff also noted that the UFSAR Supplement provides for periodic update of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to implement changes to 10 CFR 50.55a. The staff finds this to be acceptable because it is in compliance with the requirements of 10 CFR 50.55a.

The staff noted that in the applicant's Commitment No. 1, the applicant committed to submit changes to the LRA that are required based on changes to the Current Licensing Basis (CLB), which affect the contents of the LRA, including UFSAR Supplements summary sections for the LRA. Thus, the staff also noted that the scope of the commitment includes the need to update the program elements of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program in order to incorporate the new augmented inspection requirements for upper reactor vessel closure head (RVCH) penetration nozzles that were mandated in 10 CFR 50.55a(g)(6)(ii)(D) and (E), and for Alloy 600 base metal components and Alloy 82 or 182 weld components in reactor coolant pressure boundary Class 1 components that were mandated in accordance with 10 CFR 50.55a(g)(6)(ii)(E). The staff finds this to be acceptable because it is in compliance with the requirements 10 CFR 54.21(b).

The staff determined that the UFSAR Supplement for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program 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 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD 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).

3.0.3.1.4 ASME Section XI, Subsection IWE

Technical Information in the Application. LRA Section B2.1.4 describes the existing ASME Section XI, Subsection IWE Program as consistent with GALL AMP XI.S1 "ASME Section XI, Subsection IWE." The applicant stated the program provides for condition monitoring of Class MC pressure-retaining components and related items, including integral attachments, seals, gaskets, moisture barriers, and pressure-retaining bolting. The program is implemented in accordance with the requirements of 10 CFR 50.55a and utilizes ASME Section XI, Subsection IWE, 1992 Edition including the 1992 Addenda for the current inspection interval. The program will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

Staff Evaluation. During the audit, the staff interviewed the applicant's technical staff and reviewed the applicant's ASME Section XI, Subsection IWE basis documents to determine the program's consistency with GALL AMP XI.S1. Specifically, the staff reviewed the program elements and the associated onsite documents. On the basis of its review, the staff finds the applicant's ASME Section XI, Subsection IWE Program consistent with the program elements of GALL AMP XI.S1, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.4. The applicant stated that PINGP has had issues with minor coating degradation, which were identified and corrected. During the audit, the staff asked the applicant why the coating degradation was not captured under a coating AMP. The applicant explained that an AMP was not needed for coatings because they are not credited for aging management. Although the coatings are not credited for aging management, the staff believes their failure could result in the failure of a safety system to perform its intended function. In RAI B2.1.4-1 dated November 5, 2008, the staff requested that the applicant justify not having an AMP for coatings.

In its response dated December 5, 2008, the applicant stated that coatings inside containment provide protection for the underlying base metal but are not relied upon to mitigate any aging effect. The Containment Inservice Inspection and Containment Leak Rate Programs are credited with managing the containment vessel for loss of material due to corrosion. The applicant further stated that both programs look for evidence of flaking, blistering, peeling, discoloration, corrosion and other signs of distress. Suspect areas are accepted by engineering evaluation or corrected by repair or replacement. The RAI response also explains that PINGP has performed an analysis of the susceptibility of the Emergency Core Cooling System (ECCS) and Core Spray System (CSS) recirculation functions to adverse effects of post-accident debris blockage. The analysis assumed that all qualified coating within the zone of influence of the worst case pipe break fail and that all unqualified coatings inside containment fail. The applicant concluded that the analysis demonstrated that debris will not prevent a safety-related component from performing its intended function. The applicant further stated that since the failed coatings would not prevent a safety-related component from performing its safety function, the coatings inside containment do not fall within the scope of 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant’s response to RAI B2.1.4-1 acceptable because PINGP has programs in place to capture, evaluate and correct degraded coatings and has performed an analysis which demonstrates that failed coatings inside containment will not prevent a safety system from performing its intended function. The staff’s concern described in RAI B2.1.4-1 is resolved.

During the audit, the staff also noted that PINGP had identified an ongoing issue with water seepage from the refueling cavity into the containment sumps. In RAI B2.1.38-2 dated November 5, 2008, the staff requested the applicant provide information regarding the root cause analysis of the seepage, as well as corrective and preventive actions taken to correct the problem. In the LRA, this seepage issue is tracked under the Structures Monitoring Program, but the staff believes that it also applies to the IWE program due to the possibility of borated water coming into contact with the containment vessel.

By letter dated December 5, 2008, the applicant responded to RAI B2.1.38-2. The applicant stated that the condition was detected by the ASME Section XI, Subsection IWE Program while examining the Class MC pressure retaining vessel. Both the Structures Monitoring Program and the ASME Section XI, Subsection IWE Program took corrective actions to address the leakage. In addition, the applicant provided information during a public meeting on March 2, 2009. The staff reviewed the information provided in the RAI response and during the public meeting and discovered that borated water was coming into contact with the containment vessel during refueling outages. Due to the leakage path of borated water along the bottom of the vessel, the staff realized there is also a possibility that portions of the containment vessel may remain wetted after refueling outages. By letter dated March 31, 2009, the staff issued follow-up RAI B2.1.38 asking the applicant to discuss its plan for assessing the current condition of the steel containment vessel and to explain how the IWE program, or a plant specific program, will manage aging of the vessel, especially in inaccessible regions, during the period of extended operation. By letter dated April 6, 2009, the applicant responded to follow-up RAI B2.1.38. the Staff also conducted an audit on May 28, 2009, to review related on-site documentation. The staff is currently reviewing the RAI response, as well as the information gathered during the audit. This is **Open Item 3.0.3.2.17-1**.

On the basis of its review, pending successful resolution of Open Item 3.0.3.2.17-1, 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, pending resolution of Open Item 3.0.3.2.17-1.

UFSAR Supplement. In LRA Section A2.4, the applicant provided the UFSAR supplement for the ASME Section XI, Subsection IWE Program. The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's ASME Section XI, Subsection IWE Program, including the applicant's response to RAI B2.1.4-1 and RAI B2.1.38-2, and pending closure of Open Item 3.0.3.2.17-1, 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).

3.0.3.1.5 ASME Section XI, Subsection IWF

Summary of Technical Information in the Application. LRA Section B2.1.5 describes the existing ASME Section XI, Subsection IWF Program as consistent with GALL AMP XI.S3 "ASME Section XI, Subsection IWF." The applicant stated the program provides for condition monitoring of Class 1, 2, and 3 component supports. The applicant stated that there are no Class MC component supports installed at PINGP. The applicant further stated the program is implemented in accordance with the requirements of 10 CFR 50.55a and utilizes ASME Section XI, Subsection IWF, 1998 Edition, including the 1998, 1999 and 2000 Addenda for the current inspection interval. The program will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

Staff Evaluation. During its audit, the staff interviewed the applicant's technical staff and reviewed the applicant's ASME Section XI, Subsection IWF Program basis documents to determine the program's consistency with GALL AMP XI.S3. Specifically, the staff reviewed the program elements and the associated onsite documents. During its audit, the staff noted that the PINGP IWF basis document states the program includes inspections of concrete and grouting for component support building structure attachments. The staff questioned why concrete inspections fell under the IWF Program. The applicant explained that this only relates to localized areas where the support is anchored; a different program (Structures Monitoring Program) is responsible for inspecting general concrete. This was verified by the staff in the site procedures. The staff found this explanation acceptable because it aligns the inspections with the proper GALL AMPs. On the basis of its review, the staff finds the applicant's ASME Section

XI, Subsection IWF Program consistent with the program elements of GALL AMP XI.S3, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.5. The applicant stated that minor conditions, such as improper can settings and unacceptable arc strikes have been identified and corrected. During the audit, the staff reviewed samples of CRs and interviewed the applicant's technical staff to verify that these conditions were properly corrected in a timely fashion. The staff's review confirmed that the plant-specific OE did not reveal an adverse trend in program performance or any unacceptable aging-related 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 this program element acceptable.

UFSAR Supplement. In LRA Section A2.5, the applicant provided the UFSAR supplement for the ASME Section XI, Subsection IWF Program. The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's ASME Section XI, Subsection IWF 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).

3.0.3.1.6 Boric Acid Corrosion

Summary of Technical Information in the Application. LRA Section B2.1.7 describes the Boric Acid Corrosion program as an existing program that is consistent with GALL AMP XI.M10, "Boric Acid Corrosion." The applicant stated that this program includes periodic visual examinations of the reactor coolant pressure boundary and other systems containing borated water for evidence of leakage and corrosion. The applicant also stated that adjacent structures, components (including electrical), and supports are also examined for boric acid accumulation and corrosion. The applicant further stated that this program includes evaluations, assessments, and corrective actions for observed leakage sources and any affected SCs. The applicant also indicated that the Boric Acid Corrosion Program includes provisions for triggering evaluations and assessments when leakage is discovered while performing other plant walkdowns or maintenance activities.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff confirmed that the applicant's program contains all of the program elements of the referenced GALL AMP. The staff also conducted on-site interviews with the applicant on its program in order to confirm these results.

The staff reviewed the applicant's license renewal basis document for the Boric Acid Corrosion Program and confirmed that the program scope includes those steel (including carbon steel, alloy steel, and cast iron), copper alloy, and aluminum alloy systems and components that could be affected by the impacts of borated water leakage and boric acid corrosion. In comparing the program elements in the applicant's program to those in GALL AMP XI.M10, the staff confirmed that the program elements in the applicant's program are consistent with the recommended program elements of GALL AMP XI.M10.

In comparing the program elements in the applicant's AMP to those in GALL AMP XI.M10, the staff found that the applicant has identified all the systems and components included in the scope of the Boric Acid Corrosion Control Program. This includes those steel, copper alloy, or aluminum alloy components that are in the vicinity of Class 1 nickel alloy components, where the potential exists for cracks to initiate and grow through wall because of stress corrosion cracking (SCC) and which have the potential to be a source of borated water leakage. This includes any steel, copper alloy, or aluminum alloy components in the vicinity of the RPV closure head penetration nozzles, RPV inlet and outlet safe-end welds, pressurizer penetration or steam space nozzles, or other nickel alloy components in the reactor coolant pressure boundary. Based on its review, the staff finds the applicant's Boric Acid Corrosion Program consistent with the program elements of GALL AMP XI.M10 and therefore acceptable.

Operating Experience. The staff reviewed the OE provided in LRA Section B2.1.7 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.

The staff also reviewed the OE discussion in the applicant's license renewal basis document for the Boric Acid Corrosion Program. The staff reviewed a sample of the CRs and confirmed that the applicant has identified boric acid corrosion and has implemented appropriate corrective actions.

In the OE element of LRA Section B2.1.7, the applicant stated that PINGP found borated water leakage and boric acid crystal accumulations. The staff issued RAI B2.1.7-1 by letter dated November 5, 2008, to ask the applicant to (a) to clarify what type of corrective actions are implemented for steel, copper alloy, and aluminum components that are exposed to borated water leakage or to boric acid residues that has precipitated out as a result of previous borated water leakage; (b) to clarify whether the program permits PINGP to leave any boric acid residues in place, and if so, how the program assesses the impacts of boric acid residues on the structural integrity of impacted components if the residues are left in place for any period of time; (c) to identify all relevant PINGP OE with borated water leakage or boric acid residues over the past five years; and (d) to discuss the corrective actions that were taken on the impacted steel, copper alloy or aluminum alloy components in order to correct the adverse conditions.

In its letter dated December 5, 2008, in response to RAI B2.1.7-1, the applicant stated, in part, that:

> Corrective actions taken as a result of the identification of borated water leakage or boric acid residue may include a combination of cleaning, repair, and/or replacement activities. The PINGP Boric Acid Corrosion Program requires complete removal of boric acid crystal buildup or deposits as part of the corrective action. Active leakage, depending upon the source and the cause, may be corrected via gasket replacement, valve packing adjustment/replacement, joint disassembly/reassembly, component replacement, or other appropriate maintenance activities.

The applicant further stated that "The PINGP Boric Acid Corrosion Program does allow boric acid residues to be left in place if supported by evaluation." For ASME pressure boundary components, ASME Section XI, IWA-5250, provides requirements for corrective measures. Based on these requirements, if left in service, 10% wall loss will not occur prior to the time the component will be repaired, or, if greater than 10% wall loss were to occur, an operability evaluation will be performed with the reduced wall thickness. This evaluation considers corrosion rates and mechanisms like surface temperature, material susceptibility, leakage rates, etc. For non-ASME or non-pressure boundary components, those indications that affect susceptible materials of ASME Section XI components are evaluated. These evaluations consider corrosion rates, boric acid concentrations, leak rates, re-inspection interval, and possible compensatory measures as necessary. For mechanical joints, leakage is inspected and monitored to trend/evaluate changes in leakage and the basis documented.

In a February 3, 2009 teleconference, the staff questioned the previous discussion of the response to RAI AMP B2.1.7-1 because it could be interpreted to indicate that boric acid residue could be left on ferritic components for extended periods. The staff requested the applicant to clarify the response. In its letter dated February 6, 2009, the applicant clarified its response as follows:

> At PINGP, boric acid residue is not normally left in place for extended periods of time. Identified boric acid leaks are cleaned and repaired effectively. Boric acid discovered in critical locations such as the reactor vessel head and other reactor coolant pressure boundary components that are only accessible for inspection during outages would be cleaned prior to startup from the outage. Boric acid residue or active leakage discovered in locations that are not reasonably accessible for cleaning or repair due to plant conditions may be allowed to remain in place for a limited period of time (e.g., until the next outage when access becomes available), but only after an evaluation has confirmed that the continued presence of boric acid would be acceptable for the expected time period.
>
> Upon identification of borated water leakage or boric acid residue, the PINGP Boric Acid Corrosion Program evaluates the condition to determine if the boric acid residues can be left in place until such time as corrective actions, as previously discussed in Part A of the Northern States Power Company (NSPM) response, can be initiated at the earliest possible convenience.

In its letter dated December 5, 2008, in response to RAI B2.1.7-1, the applicant further stated, in part, that:

> A document review of Corrective Action Program issues, NRC Inspection Reports, Program Self Assessments, Program Health Reports, and INPO Evaluations dating back to 2000, revealed instances where borated water or boric acid crystals were identified. Leakage or boric acid residue was observed on various valve stems, tubing fittings, valve-to-body joints, valve bellows, and flanged joints. The causes of the boric acid leakage were attributed to a variety of issues such as packing leakage; instrument tube fittings stripped or misaligned; valve bellows leakage; broken lock washers; failed O-rings; and gasket failures on valve body-to-bonnet joints, orifice flanges, and heat exchanger shell/channel head connections. Corrective actions involved cleaning the boric acid residue; replacing carbon steel studs and nuts with stainless steel; replacing valves and manifolds; adjusting or replacing valve packing; disassembling, cleaning, inspecting and replacing gaskets on valves, heat exchangers, and other flanged connections; adjusting the torque on valve body-to-bonnet and heat exchanger shell/channel head studs; replacing O-rings on transmitters; and tightening, rethreading, or replacing fittings. The boric acid leakage observed did not affect the structural integrity of any components.
>
> The PINGP System Engineering staff is responsible for evaluating modifications to equipment, procedures, or specifications based on incidents involving corrosion or potential corrosion. Considerations include (1) reducing the probability of leakage in susceptible areas and (2) use of corrosion resistant materials for items such as body-to-bonnet valve studs or the application of protective coatings, cladding or leakage collection methods.
> As an example of such corrective actions, PINGP Engineering implemented enhancements to valve packing procedures in order to address a number of packing leakage issues. The valve packing procedures were revised to incorporate improved valve repacking methods and techniques. Some of the key elements included instructions for packing consolidation, use of live-load packing assemblies, and the installation of hardened steel washers under the gland nut for better force transmission.

The staff reviewed the applicant's response and noted that the applicant has provided appropriate description of corrective actions that are implemented when boric acid corrosion is detected on metallic components. The staff noted that the applicant has clarified that boric acid leaks are cleaned and repaired effectively. The applicant has also provided specific examples of plant OE and corrective actions implemented as a result of this OE. During the audit, the staff reviewed several CRs that addressed boric acid leakage from valve packing glands, body-to-bonnet joints, and other mechanical joints. The staff noted that the applicant, as part of corrective actions, addressed these leaks by enhancing the valve packing procedures to improve valve packing methods, and adjusting torques on mechanical joints or replacing O-rings. The staff finds these corrective actions will mitigate boric acid leakages because the applicant has addressed the root cause of the leakages and took the appropriate corrective actions to resolve them. On that basis that the applicant has (1) processes in place to identify and address boric acid leakages, (2) clarified that boric acid residue is not normally left in place for extended periods of time, (3) identified boric acid leaks are cleaned and repaired effectively, (4) identified specific plant OE, and (5) discussed the corrective actions taken, the staff finds the applicant response acceptable and the staff considers RAI B2.1.7-1 resolved.

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 A2.7, the applicant provided the UFSAR supplement for the Boric Acid Corrosion Program. The staff verified that the applicant's UFSAR supplement summary description for the Boric Acid Corrosion Program conforms to the staff's recommended FSAR supplement guidance for these types of programs as found in SRP-LR Table 3.1-2.

Based on this review, the staff finds that UFSAR supplement Section A2.7 provides an acceptable UFSAR supplement summary description of the applicant's Boric Acid Corrosion Program because it is consistent with the UFSAR supplement summary description in the SRP-LR for Boric Acid Corrosion Program.

The staff determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Boric Acid Corrosion Program and the applicant's response to the staff's RAI, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff concludes that the applicant demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Buried Piping and Tanks Inspection

Summary of Technical Information in the Application. LRA Section B2.1.8 describes the applicant's new Buried Piping and Tanks Inspection Program. The applicant stated that this program manages loss of material on the external surfaces of carbon steel and cast iron components that are buried in soil or sand.

Staff Evaluation. During its audit, the staff confirmed the applicant's claim of consistency with the GALL Report.

LRA Section B2.1.8 provides the program description, statement of consistency with the GALL Report, OE, and the applicant's conclusion that the PINGP Buried Piping and Tanks Inspection AMP will provide reasonable assurance that loss of material will be adequately managed through the period of extended operation. The applicant stated that the Buried Piping and Tanks Inspection Program is consistent with the 10 elements of AMP XI.M34, "Buried Piping and Tanks Inspection," with no exceptions and no enhancements.

The staff confirmed that, for those program element aspects that the applicant claimed as being consistent with the recommended program elements in GALL AMP XI.M34, "Buried Piping and

Tanks Inspection" were consistent with the recommended program elements in the GALL AMP, with the exception of the "detection of aging effects" element in the applicant's AMP that the staff determined were in need of additional clarification and for which requests for additional information (RAIs) were issued to the applicant for resolution.

The staff noted that the applicant indicates that it will perform opportunistic or focused excavations and will perform subsequent visual inspections on buried piping and tanks. However, the staff also noted that the applicant's inspection method bases did not provide the basis the applicant would use to select buried piping or tank components for inspection or the basis that would it would use to expand the inspection scope if degradation was detected in the buried piping or tank components as a result of implementing this AMP. In RAI B2.1.8-2 dated December 5, 2008, the staff requested that the applicant identify the methods that it will use to select components for inspection and to expand the inspection scope if degradation is detected in the components.

In a letter dated December 18, 2008, the applicant responded to RAI B2.1.8-2 stating that there are no specific areas that are more prone to corrosion than others because the below ground environment is relatively benign and there has been no indication of loss of material on the outside of buried piping. Therefore, the applicant stated that locations for focused excavations will be based on industry experience and any degradation will be evaluated through the corrective action program and the results of this process will be used to identify susceptible locations for further inspections. The staff finds that the applicant's method to identify areas for focused inspections and potential expansion of inspection scope acceptable because initial inspections will be based on industry experience and, if necessary, expanded inspection scope will be based on the applicant's corrective action process should degradation be found.

Based on its review, the staff finds the Buried Piping and Tanks Inspection Program consistent with the program elements of GALL AMP XI.M34 and therefore acceptable.

Operating Experience. The applicant stated that the Buried Piping and Tanks Inspection Program is a new program, and therefore, has no OE related to program implementation. The applicant also stated that a review of OE did reveal that portions of the Cooling Water and Fire Protection Systems' buried piping were replaced in 1992 as a result of microbiologically influenced corrosion (MIC) indications on the internal surfaces of dead-leg portions of these systems. No external surface degradation or anomalies were identified.

The staff audited the OE reports and interviewed the applicant's technical staff. The staff noted that high tritium levels were discovered in on-site and off-site groundwater during the early days of plant operation but the OE element of AMP B2.1.8 did not discuss what caused the high tritium and whether or not the tritium source was buried tanks or piping. Discussion between the staff and the applicant during the audit indicated that the source of tritium contamination was not buried piping and that no system with buried piping contains radioactive materials or has fluids that are contaminated. Therefore, the staff determined that OE dealing with tritium contamination does not need to be included in the OE element of AMP B2.1.8 because the source of tritium contamination is not buried piping.

The staff noted that portions of buried coated carbon steel piping of the Cooling Water and Fire Protection Systems have been replaced as a result of MIC indications on the piping inside diameter. However, it is not clear to the staff what replacement material(s) were used or if coating or wrapping was used. In RAI B2.1.8-1 dated December 5, 2008, the staff requested that the applicant identify the replacement piping materials, including identification of any coatings and/or wrappings that were included in the design of the replacement piping components.

In a letter dated December 18, 2008, the applicant responded to RAI B2.1.8-1 stating that the Cooling Water (CW) System piping replacement materials were ASTM A106, Grade B and ASTM A155, Grade KC-70, Class I carbon steel piping and that the piping was coated with a coal tar enamel and wrapped. The staff verified that the Fire Protection (FP) System replacement piping materials were Class 52 and Class 53 ductile cast iron piping with a bituminous external coating. The staff finds the carbon steel and ductile cast iron replacement materials acceptable because they were coated or wrapped and because this is consistent with the recommended “preventive actions” program element criterion for wrapping or coating buried piping components in GALL AMP XI.M34.

The staff noted that the documentation provided by the applicant during the onsite review supports the applicant’s statements regarding OE and confirmed that the plant-specific OE at PINGP for buried piping and tank components did not identify any degradation in the buried piping and tank components that is not bounded by industry experience or by the ability of the program elements of this AMP to manage the effects of aging attributed to the components. Based on this review, the staff finds that the applicant’s identification of relevant OE for the buried piping components demonstrates that the applicant’s program is capable of identifying age-related degradation problems in the buried piping and tank components and that the applicant takes prompt corrective actions to evaluate, repair or replace any affected buried components.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement.</u> In LRA Section A2.8, the applicant provided its UFSAR Supplement for the Buried Piping and Tanks Inspection Program in PINGP LRA, Appendix A, Section A2.8. The staff verified that UFSAR Supplement summary description in UFSAR Supplement Section A2.8 is in conformance with the UFSAR Supplement for Buried Ping and Tanks Inspection Program that is recommended in SRP-LR, Table 3.3-2, ”FSAR Supplement for Aging Management of Auxiliary System.” The staff also verified that in Commitment No. 5 of the License Renewal Commitments that the applicant committed to implement the Buried Piping and Tanks Inspection Program before the period of extended operation and continue it through the period of extended operation.

The staff finds that the UFSAR Supplement for the Buried Piping and Tanks Inspection Program provides an adequate summary description as identified in the SRP-LR UFSAR, Table 3.3-2 as required by 10 CFR 54.21(d).

<u>Conclusion.</u> On the basis of its review of the applicant’s Buried Piping and Tanks Inspection Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately

managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Technical Information in the Application. LRA Section B2.1.12 describes the new Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP as consistent with 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 conducts periodic visual inspections on a representative sample of accessible cables and connections in identified adverse localized environments to confirm insulation integrity.

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.E1, "Electrical Cables and Connections Not Subject to 10 CFR50.49 Environmental Qualification Requirements."

The staff's review of the "corrective actions," "administrative controls," and "confirmatory controls" program elements for the new Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP 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.

The staff compared the program elements in the applicant's program to those in GALL AMP XI.E1. The staff noted that the program elements that the applicant claimed to be consistent with the GALL Report were consistent with the corresponding program element in the GALL AMP XI.E1.

Based on its review, the staff finds the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program consistent with the program elements of GALL AMP XI.E1, and therefore acceptable.

Operating Experience. The staff reviewed the OE described in LRA Section B2.1.12. The applicant stated that at PINGP there have been instances where adverse localized environments for electrical cables and connections were suspected to have caused localized cable and connection insulation degradation. The noted cases of degradation resulted in the replacement or rework of the affected cable or connection jacket/insulation.

The staff reviewed the CRs on these events in the license renewal basis binder for the AMP during its on-site review of the AMP. The staff determined that the CRs demonstrated that the applicant had implemented appropriate corrective actions.

The staff finds that the plant-specific OE is bounded by industry OE as described in GALL XI.E1. Industry OE has shown that adverse localized environments for electrical cables and connections caused by heat or radiation may exist next to or above (within three feet of) steam generators, pressurizers or hot process pipes, such as feedwater lines. These adverse localized environments have been found to cause degradation of the insulating materials on electrical cables and connections. Therefore, the staff determines that the applicant has adequately addressed this element. The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement.</u> In LRA Section A.2.12, the applicant provided the UFSAR supplement for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

The applicant committed to implement this AMP prior to the period of extended operation and identified it as LRA Commitment No. 9

<u>Conclusion.</u> On the basis of its review of the applicant's Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, 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).

3.0.3.1.9 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

<u>Summary of Technical Information in the Application.</u> LRA Section B2.1.13 describes the new Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program as consistent with GALL AMP XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits." The applicant stated that this AMP will manage the aging effect of reduced insulation resistance on non-EQ sensitive (high-voltage, low signal) instrumentation circuit cables and connections exposed to adverse localized environments and maintain electrical circuit integrity throughout the period of extended operation. The applicant also stated that this program includes either periodic review of surveillance data or testing of cables and connections for non-EQ sensitive instrumentation circuits in-scope of license renewal.

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, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

The staff's review of the "corrective actions," "administrative controls," and "confirmatory controls" program elements for the new Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits 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.

The staff compared the program elements in the applicant's program to those in GALL AMP XI.E2. The staff noted that the program elements that the applicant claimed to be consistent with the GALL Report were consistent with the corresponding program element in GALL AMP XI.E2.

Based on its review, the staff finds the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program consistent with the program elements of GALL AMP XI.E2, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.13. The applicant stated that plant-specific OE has shown a few cases where adverse localized environments for sensitive instrumentation cables and connections have been suspected to cause instances of adverse or erratic signals. The identified cases of degradation resulted in the replacement or rework of the affected cable or connection.

The staff also reviewed the CRs on these events in the license renewal basis binder for the AMP as part of its on-site review of the AMP. The staff determined that the CRs demonstrated that the applicant had implemented appropriate corrective actions.

The staff also verified that the aging effects are bounded by those identified in the GALL AMP XI.E2. Industry OE has identified a case where a change in temperature across a high range radiation monitor cable in containment resulted in a substantial change in the reading of the monitor. Changes in instrument calibration can be caused by degradation of the circuit cable and are a possible indication of electrical cable degradation. Therefore, the staff determines that the applicant has adequately addressed this element. The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.13, the applicant provided the UFSAR supplement for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits 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).

The applicant committed to implement this AMP prior to the period of extended operation and identified it as LRA Commitment No. 10.

Conclusion. On the basis of its review of the applicant's Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program, the staff finds that 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).

3.0.3.1.10 Flow-Accelerated Corrosion

Summary of Technical Information in the Application. LRA Section B2.1.17 describes the Flow-Accelerated Corrosion (FAC) Program as an existing program that is consistent with GALL AMP XI.M17, "Flow-Accelerated Corrosion." The applicant stated that the FAC Program is a condition monitoring program based on the Electric Power Research Institute (EPRI) guidelines in Nuclear Safety Analysis Center (NSAC)-202L-R2 for carbon steel and bronze components containing high-energy single phase or two phase fluids. The applicant further stated that the program manages loss of material due to FAC in piping and components by (a) conducting an analysis to determine critical locations, (b) performing baseline inspections to determine the extent of thinning at these locations, and (c) performing follow-up inspections to confirm the predictions of the rate of thinning, and repairing or replacing components as necessary.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff also confirmed that the applicant's program contains all of the elements of the referenced GALL Report program. On-site interviews were also held 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 loss of material as a result of FAC. In comparing the program 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 that the applicant 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.M17, with the exception of "monitoring and trending" program element aspects identified. The staff determined there was a need for additional information for these aspects.

The "monitoring and trending" program element in GALL AMP XI.M17 states that CHECWORKS or a similar predictive code is used to predict component degradation. In the systems conducive to FAC, as indicated by specific plant data, including material, hydrodynamic, and operating conditions. The applicant stated that CHECWORKS was implemented in late 2004. The staff issued RAI B2.1.17-1 by letter dated November 5, 2008, requesting the applicant to provide any OE such as excessive FAC requiring repair or replacement of piping that was the basis for converting to CHECWORKS.

In its letter dated December 5, 2008, in response to RAI B2.1.17-1, the applicant stated that prior to 2004 the PINGP FAC Program utilized a software application referred to as the Pipe Thinning Inspection Program (PTIP), which was developed by NSPM. The applicant further stated that the software program lacked certain features (e.g.; had no predictive capability, did not consider plant chemistry, offered limited trending ability) and did not meet the noble water chemistry standard for a predictive code for the FAC Program. The applicant also stated that this resulted in its replacement in 2004 with the EPRI CHECWORKS SFA (Steam/Feedwater Application), which was considered both the industry standard and the NMC standard. The applicant indicated that it upgraded to the CHECWORKS SFA model in order to improve its FAC Program through implementation of a more robust predictive code and that there were no FAC-related failures identified at PINGP that prompted the upgrade to CHECWORKS.

The staff reviewed the applicant response and noted that the applicant converted to CHECWORKS because it was a significantly better program than what it was using at that time. It is considered the industry standard and is recommended in the GALL AMP XI.M17 as a predictive code that could be used to predict component degradation because it provides a bounding analysis for FAC. The staff also noted that there were no FAC-related failures that prompted the upgrade to CHECWORKS. On the basis that the applicant converted to CHECWORKS because it is an industry standard and not because of significant FAC-related failures, the staff finds the applicant response acceptable. Thus, RAI B.2.17-1 is resolved.

The staff's review of the program basis document indicated that the applicant, as part of the program requirement, compares actual measured wall thickness of the component with CHECWORKS predictions of wall thickness for that component. The staff issued RAI B2.1.17-2 by letter dated November 5, 2008, requesting the applicant to confirm whether it has established a correlation between predicted results and actual wall thickness measurements, and whether PINGP had ever experienced excessive loss of material by FAC that was not predicted by CHECWORKS modeling results.

In its letter dated December 5, 2008, in response to RAI B2.1.17-2, the applicant stated that:

> Wear rate analyses are performed using the CHECWORKS SFA model. A Pass 1 Wear Rate Analysis is an analysis based solely on the plant predictive model, and is not enhanced by results of the plant wall thickness measurements. A Pass 2 Wear Rate Analysis generates predicted wear rate and remaining service life similar to a Pass 1 Wear Rate Analysis with one significant difference; results incorporate inspection data. Pass 1 Analysis results are not relied on by themselves to select locations for examination.
>
> After each inspection period, a Pass 2 Analysis is performed on each Analysis Line. An Analysis Line is defined as one or more physical lines of piping that have been analyzed together in the CHECWORKS model. As an output of the Pass 2 Analysis, CHECWORKS correlates the measured wear to the predicted wear for each Analysis Line.
>
> When calculating a component's remaining service life (RSL) and schedule for examination, both the measured wear rate and CHECWORKS predicted wear rate, among other things, are considered. The CHECWORKS predicted wear rate from a Pass 2 Analysis provides an important input to these FAC Program

> considerations, especially after an Analysis Line has accumulated sufficient field measurement data to indicate a reliable correlation with predictions.
>
> A Pass 2 Analysis has been completed through the current operating cycle for each Unit. The predictive plant model includes inspection data of the most recent outage for both Units (Refueling Outage 25; March 2008 for Unit 1, October 2008 for Unit 2). In general, the field measured wear shows a moderate to good correlation (within +/- 50%) to the CHECWORKS predicted wear. PINGP has not experienced excessive flow accelerated corrosion (FAC) that was not predicted by CHECWORKS.

The staff reviewed the applicant's response and noted that the applicant has performed a Pass 2 Analysis for each unit, which includes the inspection data from the most recent outages. The staff noted that the applicant has established a moderate to good correlation between the measured wall thickness and the CHECWORKS predicted wall thickness. The applicant is using the actual measured wall thickness and the wear rates to predict remaining life and future inspection intervals. GALL AMP XI.M17, in the "acceptance criteria" program element states that inspection results are input into CHECWORKS to calculate the number of refueling cycles remaining before the component reaches the minimum allowable wall thickness. The staff finds the applicant response acceptable because (1) the applicant performs a Pass 2 Analysis that correlates measured wear for predicted wear for each analysis line, (2) the applicant has not experienced excessive FAC that was not predicted by CHECWORKS and (3) the results of each inspection is input into CHECWORKS to determine remaining life as recommended by GALL AMP XI.M17. Thus, RAI B2.17-2 is resolved.

The staff's review of the program basis document indicated that system changes could increase wear rates or subsequent reinspection could indicate significantly higher wear rates. The staff issued RAI B2.1.17-3, by letter dated November 5, 2008, requesting the applicant identify what process or procedure is used to address changes in the chemical, operating and flow conditions that could impact remaining life predictions, and how these changes are factored into the FAC Program so that the remaining service life can be re-evaluated.

In its letter dated December 5, 2008, in response to RAI B2.1.17-3, the applicant stated the following:

> PINGP Flow-Accelerated Corrosion (FAC) procedures require that if system conditions appear to have changed in such a way as to increase wear rates, or subsequent re-inspections indicate that wear rates are significantly higher than previously predicted, then consideration should be given to conducting inspections at an increased frequency. Additionally, plant operating conditions are taken into consideration for FAC based upon recommendations from the PINGP System Engineering, Chemistry, Operations and Maintenance Departments.
>
> The PINGP Strategic Water Chemistry Plan recognizes the importance of minimizing FAC on the secondary cycle components. FAC is mainly influenced by the at-temperature, pH and oxygen content around the secondary cycle. The PINGP amine chemistry control program is optimized to minimize FAC of secondary system components. The Chemistry Department maintains the

system chemistries in accordance with site-specific chemistry procedures to minimize the effects of corrosion. The procedures provide for water sampling, chemical treatment application and corrosion monitoring of applicable systems. Secondary chemistry is reviewed and is input into the Unit 1 and Unit 2 CHECWORKS SFA model.

PINGP modification design procedures require notification of the FAC Program Owner when plant modifications are determined to impact the FAC Program. Design considerations that may impact the FAC Program include changes to system flow rates, temperatures, pressures, water chemistry, valve lineups, materials, system configuration, piping or component geometries, or revisions to isometric drawings. Upon notification, the FAC Program Owner provides applicable design inputs to the modification, or evaluates the impact of the modification on the FAC Program.

Changes to system parameters, such as component material, water chemistry, and power level, are factored into the PINGP CHECWORKS SFA model so that the remaining service life can be reevaluated. Conversely, the CHECWORKS SFA model is also used to provide input to material changes, water chemistry changes, and piping design. The FAC Program, through the use of CHECWORKS SFA, is used to reduce the site’s susceptibility to FAC, thereby increasing plant safety.

The staff reviewed the applicant's response and noted that the applicant has procedures in place such that system operation changes are identified and included in the CHECWORKS software program. The staff finds the applicant’s response acceptable because (1) the applicant ensures the quality of secondary water is maintained within acceptable limits, (2) FAC Program owner is notified of system modifications so that the owner is aware of the changes prior to implementation of the modification, and (3) the changes to system parameters are factored into the CHECWORKS software so that the remaining service life can be more accurately predicted based on the system is changed parameters. The staff finds that this is consistent with GALL AMP XI.M17 recommendation that CHECWORKS predictive code is used to predict component degradation, as indicated by specific plant data, including material, hydrodynamic, and operating conditions. Based on this review, the staff finds that the applicant has processes in place to ensure that changes in the chemical, operating and flow conditions that could affect remaining life predictions are factored into the FAC program. Thus, RAI B2.1.17-3 is resolved.

The “monitoring and trending” program element in GALL AMP XI.M17 states that inspection results are evaluated to determine if additional inspections are needed. The staff issued RAI B2.1.17-4 dated November 5, 2008, to request the applicant (a) provide information on how PINGP expands sample size; (b) provide the acceptance criterion used for sample expansion and whether it is related to thickness or to wear rates; and (c) indicate whether there is a different value used for safety-related and nonsafety-related piping.

In its letter dated December 5, 2008, in response to RAI B2.1.17-4, the applicant stated the following:

(a) In accordance with the PINGP Flow-Accelerated Corrosion (FAC) Program implementing procedure, the criteria for sample expansion and the sample expansion guidelines are as follows:

"To ensure CHECWORKS SFA model prediction accuracy the following sample expansion guidelines have been established.

(1) If examination results are unexpected and inconsistent with predictions, and have a significant negative effect on component remaining service life, and are solely attributable to FAC wear and not weld prep (counterbore), then the sample should be expanded to include the following (unless they have been examined within three inspection periods):

(a) Any component within two diameters downstream of the component displaying significant wear or within two diameters upstream if that component is an expander or expanding elbow.

(b) A minimum of the next two most susceptible components from the relative wear ranking in the same train as that containing the piping component displaying significant wear.

(c) Corresponding components in each other train of a multi-train run with a configuration similar to that of the piping component displaying significant wear.

(2) If inspections of the expanded sample specified under Item (1) above detect additional components with significant FAC wear, then the sample should be further expanded to include:

(a) Any component within two diameters downstream of the component displaying significant wear or within two diameters upstream if that component is an expander or expanding elbow.

(b) A minimum of the next two most susceptible components from the relative wear ranking in the same train as that containing the piping component displaying significant wear.

(3) If inspections of the expanded sample specified under Item (2) above detect additional components with significant wear, then expansion of the sample specified under Item (2) should be repeated until no additional components with significant wear are detected.

The sample expansion guidelines are intended to add more examination data to calibrate the CHECWORKS SFA model, thereby increasing the accuracy of the prediction."

(b) Sample expansion is based upon wall thickness (e.g., measured wall thickness significantly less than predicted wall thickness) and wear rate (e.g., results negatively affecting remaining service life).

(c) The FAC Program is applicable to both safety-related and nonsafety-related piping systems susceptible to FAC. The inspection sample is a subset of the systems that make up the overall program scope and generally represents the most FAC-susceptible piping in the plant. The sample expansion guidelines are applicable to all in-scope piping, and are applied consistently to both safety-related and nonsafety-related piping.

The staff reviewed the applicant's response and noted that the applicant provided the sample expansion criteria, which includes additional components within two pipe diameters upstream and downstream of the degraded component, the two most susceptible components in the same train, and a minimum of two components in another train of a multi-train system. In addition, the staff noted that the applicant will increase the sample size until no additional components with significant wear are detected. The staff finds the applicant response acceptable because the sample expansion scope includes the appropriate locations to determine the extent of degraded components, and the applicant is consistent with the GALL AMP XI.M17 recommendation of evaluating the results of the inspection to determine if additional inspections are needed. In its response to Part B, the staff noted that the applicant uses both the wall thickness and wear rate as a basis for sample expansion. The staff finds the applicant’s response to (b) acceptable because using both the actual measured wall thickness and the wear rate in combination provides a more realistic basis for calculating remaining life and for sample expansion. In response to (c), the staff noted that the applicant applies the FAC Program to safety-related and nonsafety-related systems. The staff determined that the CHECWORKS model identifies the most FAC-susceptible piping in the plant irrespective of safety or nonsafety-related system. The staff finds the applicant’s response to (c) acceptable because the FAC Program and the CHECWORKS model does not distinguish between safety- and nonsafety-related systems, but determines the most FAC-susceptible piping, and uses the same sample expansion criteria for safety and nonsafety-related systems. RAI B2.1.17-4 is resolved.

The “detection of aging effects” program element in GALL AMP XI.M17 states that the extent and schedule of the inspections assure detection of wall thinning before the loss of intended function. The staff issued RAI B2.1.17-5, by letter dated November 5, 2008, to request the applicant to indicate how PINGP calculates minimum permitted wall thickness to avoid loss of intended function and how it is used for the determination of the schedule of inspections in the FAC analysis.

In its letter dated December 5, 2008, in response to RAI B2.1.17-5, the applicant stated that:

> Per the requirements of the PINGP Flow-Accelerated Corrosion (FAC) Program, the minimum permitted wall thickness or Code Minimum Wall Thickness (t_{min}) is calculated in accordance with the original construction code, which is USAS B31.1.0, Power Piping, 1967 Edition. Additionally, the program may define a Critical Wall Thickness (t_{crit}) for a component, as determined by engineering analysis. The critical wall thickness is typically a larger value than tmin. In turn, the remaining service life for a component is the estimated number of years until the wall thickness violates t_{min}, t_{crit}, or other established acceptance criteria. The remaining service life is based on measured wear rates or the predicted wear rates calculated by the CHECWORKS SFA application. The remaining service life is used to determine the appropriate future inspection schedule.
> The FAC Program schedules follow-on examinations for specific components based upon previous examinations and evaluation results. Follow-on examinations are scheduled no later than the normal inspection period (e.g.,

refueling outage) preceding the end of the predicted FAC remaining service life of the component. Engineering judgment and an appropriate safety factor (per the guidance of NSAC-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program") are utilized when scheduling follow-on exams. Typically, follow-on examinations are scheduled at half of the remaining service life and no later than the normal inspection period prior to the point at which the calculated t_{min} or t_{crit} is reached.

The extent and schedule of the examinations assure detection of wall thinning before the loss of intended function.

The staff reviewed the applicant response and noted that the applicant uses the B31.1.0 Code to determine the minimum permitted wall thickness. The staff also noted that the applicant uses a thickness value larger than the minimum to determine the remaining service life. The staff reviewed EPRI guidelines in NSAC-202L-R2, Section 4.4.3, Follow-On Inspections, which states that the next inspection for each component be scheduled for no later than the normally scheduled refueling outage preceding the end of the predicted FAC service life of the component plus an appropriate safety factor. Since the GALL AMP XI.M17 relies on implementation of EPRI guidelines in NSAC-202L-R2 for an effective FAC program, the staff finds that the applicant is consistent with GALL AMP XI.M17. The staff finds the applicant's response acceptable because the applicant is using the original construction code to determine minimum wall thickness, the applicant uses a higher thickness value to determine remaining service life, and based on the wear rates determines the intervals of follow-on inspections, and is consistent with GALL AMP XI.M17. RAI B2.1.17-5 is resolved.

In a letter dated March 12, 2009, the applicant revised the LRA for the FAC Program to update to the latest EPRI guidance, which is an exception to the GALL Report XI.M17, Flow-Accelerated Corrosion. In the letter, the applicant states the following for the Program Description:

The Flow-Accelerated Corrosion (FAC) Program is a condition monitoring program established in accordance with the Electric Power Research Institute (EPRI) guidelines in Nuclear Safety Analysis Center (NSAC)-202L-R3 for carbon steel and bronze components containing high-energy single phase or two phase fluids. The program manages loss of material due to FAC in piping and components by (a) conducting an analysis to determine critical locations, (b) performing baseline inspections to determine the extent of thinning at these locations, and (c) performing follow-up inspections to confirm the predictions of the rate of thinning, or repairing or replacing components as necessary. This program complies with PINGP's response to NRC Generic Letter 89-08.

This change in the LRA produces an exception to the GALL Report. The applicant stated in the letter the following:

Exceptions to NUREG-1801

Program Elements Affected

Scope of Program, Detection of Aging Effects

> PINGP implements the guidance provided in EPRI NSAC-202L-R3, "Recommendations for and Effective Flow-Accelerated Corrosion Program," May 2006, in lieu of the NUREG-1801 recommendation of EPRI NSAC-202L-R2, "Recommendations for and Effective Flow-Accelerated Corrosion Program," April 1999. EPRI NSAC-202L-R3 is the most recent revision of this document, and it provides more prescriptive guidance based on the latest industry OE. Use of the current guideline is an acceptable method to maintain the FAC-susceptible systems at PINGP.

The staff finds that this exception is acceptable because the revised guideline is more prescriptive than the guidance referenced in the GALL Report. Most of the recent applicants have also switched to the latest EPRI guidance and the latest guidance will be incorporated in the next update to the GALL Report.

Based on its review, and resolution of the RAIs as described above, the staff finds the FAC Program consistent with program elements of GALL AMP XI.M17, and therefore acceptable.

<u>Operating Experience.</u> The staff reviewed the OE provided in LRA Section B2.1.17 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.

The staff also reviewed the applicant's OE discussion that was provided in the applicant's license renewal basis document for the FAC Program. The staff reviewed a sample of CRs and confirmed that the applicant had identified age-related degradation and implemented appropriate corrective actions.

The staff reviewed the Unit 1 Outage Summary Report for FAC inspections performed from April to June 2006. The staff noted that a total of 74 components were ultrasonically inspected for FAC. In addition, the staff noted that there were nine locations added as a result of scope expansion. The staff also noted that there were three minimum wall violations and seven components were replaced as a result of the FAC inspections.

The staff also reviewed the Unit 2 Outage Summary Report for FAC inspections performed from November to December 2006. The staff noted that a total of 93 components were ultrasonically inspected for FAC wear. In addition, the staff noted that there were 16 locations added as a result of scope expansion. The staff also noted that there was one minimum wall violation and one component was replaced as a result of the FAC inspections. The staff noted that the applicant replaced the component with like-for like material; however, the Outage Summary Reports recommended that future replacements of small-bore heater drain lines should utilize FAC resistant material.

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 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 A2.17, the applicant provided the UFSAR supplement for the FAC Program. The staff verified that the UFSAR supplement summary description for the FAC Program was in conformance with the staff's recommended UFSAR supplement for these types of programs provided in Table 3.4-2 of the SRP-LR.

Based on this review, the staff determines that UFSAR supplement Section A2.17 provides an acceptable UFSAR supplement summary description of the applicant's FAC because it is consistent with those UFSAR supplement summary description in the SRP-LR for FAC Program.

The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's 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).

3.0.3.1.11 Fuse Holders

Summary of Technical Information in the Application. LRA Section B2.1.20, describes the Fuse Holders Program as a new program that is consistent with GALL AMP XI.E5, "Fuse Holders." The applicant states that the Fuse Holders Program is a condition-monitoring program that implements periodic visual inspections and tests on fuse holders in-scope of license renewal, located in passive enclosures and assemblies, and exposed to environments that potentially could lead to electrical circuit failures if left unmanaged. The applicant further states that the fuse holders (metallic clamps) program manages the effects of aging from adverse localized environments caused from the following aging stressors, as applicable: fatigue, mechanical stress, vibration, chemical contamination, and corrosion. The applicant also states that fuse holders determined to be operating in an adverse localized environment will be visually inspected and tested at least once every 10 years. The first visual inspections and tests will be completed before the period of extended operation. The applicant also states that the specific type of test to be performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of metallic clamps of the fuse holders, such as thermography, contact resistance testing, or other appropriate testing.

Staff Evaluation. During the audit, the staff reviewed the applicant's claim of consistency with the GALL Report. GALL AMP XI.E5 under "program description" states that the AMP for fuse holders (metallic clamps) needs to account for the following stressors, if applicable: fatigue, mechanical stress, vibration, chemical contamination, and corrosion. The applicant's Fuse Holder Program under the same program element only listed fuse holders (metallic clamps) in adverse localized environments. Adverse localized environment is defined in the GALL Report as high heat, high radiation, or high moisture. Fuse holders could be exposed to the above stressors in a mild environment not necessarily in an adverse localized environment. In a letter dated November 5, 2008, the staff issued RAI B2.1.20-1 and requested the applicant to explain how the environment of the applicant's fuse holder program is consistent with those in the GALL AMP XI.E6.

In a letter dated December 5, 2008, the applicant responded that the use of the terminology "adverse localized environment" in the Fuse Holders Program was intended to encompass the term "stressors" in the GALL Report. To remove confusion, the applicant revised the affected LRA sections to remove reference to "adverse localized environments" in the descriptions of the Fuse Holder Program, as follows:

In LRA Section A2.20, "Fuse Holders Program," on Page A-9, the existing program description is replaced in its entirety with a new program description, to read as follows:

> The Fuse Holders Program is a condition monitoring program that implements periodic visual inspections and tests of fuse holders in scope of License Renewal, located in passive enclosures and assemblies, and exposed to stressors that could affect the electrical circuit (metallic connection with the fuse) if left unmanaged during the period of extended operation. The Fuse Holders Program accounts for the following stressors, if applicable: fatigue, mechanical stress, vibration, chemical contamination, and corrosion. Fuse holders determined to be exposed to stressors subject to aging effects will be visually inspected and tested at least once every 10 years. The first visual inspections and tests will be completed before the period of extended operation. The specific type of test to be performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of metallic clamps of the fuse holders, such as thermography, contact resistance testing, or other appropriate testing. This program will be implemented prior to the period of extended operation.

In LRA Section B2.1.20, "Fuse Holders Program," on Page B-48, the applicant replaced the existing Program Description in its entirety with a new program description, to read as follows:

> The Fuse Holders Program is a condition monitoring program that implements periodic visual inspections and tests on fuse holders in scope of license renewal, located in passive enclosures and assemblies, and exposed to stressors that could affect circuit integrity if left unmanaged. The AMP for fuse holders (metallic clamps) manages the effects of aging from the following stressors, as applicable: fatigue, mechanical stress, vibration, chemical contamination, and corrosion.
>
> Fuse holders are reviewed, inspected and/or tested to determine if they are exposed to stressors that could aversely affect circuit integrity (metallic connection with the fuse) if left unmanaged during the period of extended operation. A stressor could affect circuit integrity if it promotes loose connections

> from clip relaxation/fatigue (ohmic heating, thermal cycling or electrical transients, mechanical fatigue caused by frequent removal/replacement of the fuse, or vibration), or if it exposes the fuse holder to chemical contamination or moisture that would promote corrosion and oxidation of the metallic fuse clips.
>
> Fuse holders requiring aging management will be visually inspected and tested at least once every 10 years. The first visual inspections and tests will be completed before the period of extended operation. The specific type of test to be performed will be determined prior to the initial test, and is to be a proven test for detecting deterioration of metallic clamps of the fuse holders, such as thermography, contact resistance testing, or other appropriate testing.

In LRA Table 3.0-3, "Electrical Service Environments," on Page 3.0-19, the applicant deleted the last line item on the page (Mechanical Cycling) in its entirety and replaced with the following:

“Stressors: Fuse Holders (Metallic Parts - clips) exposed to the following stressors, if applicable: fatigue, mechanical stress, vibration, chemical contamination, and corrosion.”

In LRA Section 3.6.2.1.7, on Page 3.6-7, under Environment, the applicant replaces the two bullet items "Adverse localized environment (causing corrosion and/or fatigue)" and "Mechanical Cycling" with the single new bullet environment "Stressors."

In LRA Table 3.6.2-1, "Electrical Components - Electrical Commodity Groups - Summary of Aging Management Evaluation," on Page 3.6-20, for the line item "Fuse Holders (metallic parts) not part of a larger active assembly," the applicant replaces the existing entries under Environment, "Adverse localized environment, Mechanical Cycling" with the new entry "Stressors."

The staff finds the applicant response acceptable because the applicant revised various LRA sections to remove a reference to “adverse localized environments” and replaced them with the applicable stressors as described in GALL AMP XI.E5 for fuse holders (metallic clamps). These stressors are fatigue, mechanical stress, vibration, chemical contamination, and corrosion. With these revisions, the staff finds the applicant’s Fuse Holders AMP is consistent with the GALL AMP XI.E5.

By letter dated April 13, 2009, the applicant proposed a commitment (Commitment No. 16) to enhance the program as described above.

Based on its review of the LRA, including the applicant’s response to RAI B2.1.20-1, the staff finds the applicant’s Fuse Holder Program consistent with the program elements of GALL AMP XI.E5, and therefore acceptable.

<u>Operating Experience.</u> In LRA Section B2.1.20, the applicant states that Fuse Holders Program is a new program, and, therefore, has no OE related to program implementation. The applicant conducted a review of plant-specific OE and did not identify any fuse connection failure from potential age-related causes. The applicant’s plant OE review did identify fuse enclosure issues involving water intrusion from event driven causes (e.g., water leaked into conduit and emptied

into enclosure). These moisture intrusion events for enclosures exposed to this adverse localized environment could promote a corrosion for the metallic contact surfaces, leading to increased contact resistance and circuit failure if left unmanaged. The applicant also states that inspections and testing (thermography) were performed on fuse holders in-scope of license renewal in terminal boxes and junction boxes located outside containment. This initial inspection and testing revealed that some enclosures had significant signs of oxidation that could adversely affect the fuse holders if not repaired or reworked. The applicant entered these conditions into the Corrective Action Program for disposition. For adverse aging environments, this program will ensure the integrity of fuse holders in-scope of License Renewal and located in passive enclosures during the period of extended operation.

The staff reviewed the OE provided in the LRA and in the basis documents that were available during the audits. Based on the review of the applicant-identified OE, the staff has confirmed that the applicant has identified aging effects of fuse holders, etc, increased contact resistance due to corrosion and taken appropriate corrective actions to address the fuse holder corrosion issue. Therefore, the staff determines that the applicant has adequately addressed this element. 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 A2.20, the applicant provided the UFSAR supplement for the Fuse Holder AMP. The staff reviewed this section and determined that the information in UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

The applicant committed to implement this AMP prior to the period of extended operation and identified it as LRA Commitment No. 16.

Conclusion. On the basis of its audit and reviews of the applicant Fuse Holders Program, including the applicant’s response to RAI B2.1.20-1, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.12 Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Technical Information in the Application. LRA Section B2.1.21 describes the new Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as consistent with GALL AMP XI.E3, “Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.” The applicant stated that this AMP will conduct periodic tests to provide an indication of the condition of the conductor insulation for medium voltage cables in-scope of license renewal exposed to adverse localized environments and subjected to voltage stress. The applicant also stated that periodic inspections of the underground medium voltage cable manhole for the accumulation of water (and draining if necessary) will be conducted to minimize prolonged high moisture conditions that promote the growth of water trees.

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.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The staff's review of the "corrective actions," "administrative controls," and "confirmatory controls" program elements for the new Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements 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.

The staff compared the programs elements in the applicant's program to those in GALL AMP XI.E3. The staff noted that the program elements that the applicant claimed to be consistent with GALL were consistent with the corresponding program element in GALL AMP XI.E3.

Based on its review, the staff finds the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program consistent with the program elements of GALL AMP XI.E3, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.21. The applicant stated that in response to NRC Generic Letter 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients," dated February 7, 2007, the applicant reported that three underground medium voltage power cable failures had occurred. The staff noted PINGP has OE with two medium voltage cable failures and a failed megger test. Corrective actions have been taken to address all cable failure issues by replacing failed cables. The applicant also responded that it intended to implement an "Underground Cable Maintenance Program" by the end of 2007 due to its history with cable failures. During the AMR audit, the staff found that the applicant had not yet implemented this program. The applicant created Action Report #01150075 in response to the site not having implemented the response to NRC Generic Letter (GL) 2007-01. The staff reviewed and referred this issue to the Reactor Oversight Process. During a follow-up Regional License Renewal Inspection, the staff revisited this issued and noted that PINGP had a cable condition monitoring program (H43) in place as of March 2008 and the actual testing of the cables is governed by Procedures PE 4826 (testing of cables rated less than 600 volts) and 4825 (testing of cables rated greater than 600 volts). The applicant stated that Preventive Maintenance Change Requests (PMCRS) 01123654 (low voltage cables) and 01123652 (medium voltage cables) have been generated by the licensee to complete testing of cables within the next four outages. The full description of this inspection is documented in Inspection Report 0500282/2009006 and 0500306/2009006 dated March 27, 2009.

The staff reviewed CRs as part of its on-site review of the AMP. In reviewing OE for PINGP, the staff observed that the applicant had two separate cable failures and one additional failed cable test. As noted above, corrective actions have been taken to address all cable failure issues by replacing failed cables. The staff determined that the CRs demonstrated that the applicant had implemented appropriate corrective actions. The staff also verified that the aging effects are bounded by those identified in the GALL AMP XI.E3. Therefore, the staff determines that the applicant has adequately addressed this element. 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 A2.21, the applicant provided the UFSAR supplement for the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The staff reviewed this section and determines that the information in the UFSAR supplement provided an adequate summary description of the program, as required by 10 CFR 54.21(d).

The applicant committed to implement this AMP prior to the period of extended operation and identified it as LRA Commitment No. 17.

Conclusion. On the basis of its review of the applicant's Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program, the staff finds all program elements 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).

3.0.3.1.13 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Summary of Technical Information in the Application. LRA Section B2.1.22 describes the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program as consistent with GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." The applicant stated that this is a new program and will be credited to manage loss of material and cracking for the internal surfaces of mechanical components in the scope of this program. The applicant stated that this program provides for internal visual inspections during scheduled preventive and corrective maintenance activities or during routine surveillance procedures when the internal surfaces are accessible for these inspections.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff's summary of its on-site review of AMP B2.1.22, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, is documented in staff's Audit Summary Report Section for this AMP.

In comparing the seven programs elements in the applicant's program to those in GALL AMP XI.M38, the staff noted that the program elements which the applicant claimed its AMP were consistent with the GALL Report were consistent with the corresponding program element criteria recommended in the program elements of GALL AMP XI.M38 with the exception of those areas in which the staff determined there was a need for additional clarification, for which RAIs were issued. The OE program element is discussed separately below.

The staff noted that GALL AMP XI.M38 recommends that only steel components are managed for the aging effect of loss of material. However, during the staff's review of LRA Section B2.1.22 and of the AMR line items that credit this program for aging management in LRA Section 3.0, the staff noted that the applicant has expanded the scope of materials to include additional metallic components, other than steel, and has also credited this program with managing cracking due to SCC in stainless steel components. Therefore by letter dated November 5, 2008, the staff issued RAI B2.1.22-1 requesting the applicant to:

(a) justify why the expansion in the scope of materials to include additional metallic components other than steel, and in the scope of aging effects to include cracking due to SCC are not considered an enhancement to the program;

(b) justify how this program will adequately manage the aging effect of loss of material and any associated aging mechanisms, as it applies to the additional metallic components added to the scope of this program; and

(c) identify and justify the inspection techniques that will be used by this program that will be capable of detecting cracking due to SCC in stainless steel components or provide an appropriate program to manage cracking due to SCC for stainless steel components.

The applicant responded to RAI B2.1.22-1 by letter dated December 5, 2008. The applicant stated in Part A of its response that its program as described in LRA Section B2.1.22 is a new program and therefore enhancements are not applicable. The applicant further stated that enhancements are only applicable to existing plant programs. The staff noted in Section 3.0 of the SRP-LR that enhancements are revisions or additions to existing AMPs**.** The staff determined that the applicant has appropriately not identified the expansion in-scope of materials and aging effects as enhancements. The staff finds the applicant's response to Part A to be acceptable because the applicant's program does not meet the definition of an enhancement in the SRP-LR and the staff will evaluate the adequacy of these expansions in its evaluation of Parts B and C of the RAI.

The applicant responded to Part B of the RAI by stating that the program is utilizing established visual techniques that are capable of detecting loss of material due to corrosion and fouling. The applicant further stated that the inspections will be performed periodically such that aging effects will be detected prior to the loss of intended functions. The staff noted that the presence of corrosion or fouling can be identified by the applicant as localized discoloration and surface irregularities such as rust, scale/deposits, surface pitting, surface discontinuities, and coating degradation. The staff noted that metallic components, including aluminum, brass and bronze, CASS, copper alloy, copper-nickel and stainless steel, would exhibit indications of loss of material on the surface similar to a steel material and that visual inspections will be capable of detecting any surface breaking flaws (i.e., cracks or surfaces areas that have exhibited loss of material) that occur on the same side as that being examined. On the basis of its review, the staff finds Part B of the applicant's response to be acceptable because the applicant will be performing visual inspections that are capable of detecting loss of material in metallic components as they display indications of corrosion similar to steel, for which GALL AMP XI.M38 was intended to detect.

The applicant responded to Part C of the RAI by stating that the use of this program will only be used to detect cracking due to SCC for stainless steel flexible connections that are exposed to a diesel exhaust environment. The applicant further stated that the inspection techniques that will be utilized to detect this aging effect are either a visual inspection with a magnified resolution as described in 10 CFR 50.55a(b)(2)(xxi)(A) or an ultrasonic inspection method. The staff further noted that the inspection method described in 10 CFR 50.55a(b)(2)(xxi)(A), is an enhanced VT-1 inspection technique, and that GALL AMP XI.M32 recommends the use of an enhanced VT-1 or ultrasonic inspection technique as an acceptable means to detect cracking due to stress corrosion cracking. The staff noted that the inspection techniques described by the applicant will be performed by qualified personnel in accordance with PINGP procedures and processes. On the basis of its review, the staff finds the applicant's response to Part C of RAI acceptable because (1) the applicant's inspection techniques, enhanced VT-1 or ultrasonic methods, to detect cracking due to SCC are consistent with the recommendations of GALL AMP XI.M32, (2) the applicant's enhanced VT-1 technique is in accordance with 10 CFR 50.55a(b)(2)(xxi)(A) and (3) these inspections will be performed by qualified personnel in accordance with approved PINGP procedures and processes.

The staff noted that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program includes LRA Commitment No. 18, which was placed on the LRA in the applicant's letter of April 13. 2009, and in which the applicant committed to implement this program prior to entering the period of extended operation and use of either an enhanced VT-1 or ultrasonic inspection techniques to detect cracking due to SCC.

On the basis of its review, the staff finds the applicant's response to RAI B2.1.22-1 acceptable as described above and therefore the staff finds the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, as committed to in LRA Commitment No. 18, to be consistent with the program elements of GALL AMP XI.M38, with acceptable augmentations as described, and is therefore acceptable. RAI B2.1.22-1 is resolved.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.22 and audited the OE reports, including a sample of CRs, and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience.

During its review, the staff noted that the Unit 1 24-CL-16 Cooling Water piping downstream of the MV-32037 had experienced wall thinning below the ASME B31.1 piping code minimum wall thickness. The applicant had noted this area was not leaking and had initiated corrective actions to address this issue. The applicant utilized nondestructive examination (NDE) methods to measure the flaw and then performed an evaluation to ensure the piping would continue to meet its design requirements. The applicant concluded that the piping was degraded but remained operable. Per ASME Code Case N 513-2 the applicant was required to take further actions and have them tracked. As required, the applicant performed a re-inspection and noted that the flaw size was unchanged from the original report, the applicant performed an augmented UT inspection of an expanded sample size of components that did not indicate a minimum wall thickness of the examined components and the applicant repaired/replaced the degraded piping during the refueling outage in December 2006.

The staff also noted that the applicant discovered a pin-hole leak in the turbine oil cooler (CW-

27-2) valve body. Subsequent UT results and evaluation by the applicant determined that the cause of the pin-hole is the result of MIC. The applicant replaced the valve during the Unit 1 refueling outage in November 2002.

The staff reviewed the OE provided in the LRA and interviewed the applicant's technical staff to confirm that the OE did not reveal degradations that are not bounded by industry experience. The staff confirmed that there has not been any crack-related or loss-of-material-related OE that is not bounded by the ability of the program to detect loss of material or cracking in the components managed by the AMP or to take appropriate corrective actions if these aging effects are detected. 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; therefore, the staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A2.22, the applicant provided the UFSAR Supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components. The staff reviewed the supplement and verified that, in LRA Commitment No. 18 of the Preliminary License Renewal Commitments in a letter dated April 13, 2009, the applicant committed to implementing this program prior to the period of extended operation as described in LRA Section B2.1.22. The staff finds the UFSAR Supplement for this AMP 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, as committed to in LRA Commitment No. 18. The staff determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, the staff finds that all program elements consistent are 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).

3.0.3.1.14 Lubricating Oil Analysis

Summary of Technical Information in the Application. LRA Section B2.1.24 describes the applicant's existing Lubricating Oil Analysis Program as consistent with GALL AMP XI.M39, "Lubricating Oil Analysis." The applicant stated that the PINGP Lubricating Oil Analysis Program obtains and analyzes lubricating and hydraulic oil samples from plant equipment to ensure that the oil quality is maintained within established limits. The program calls for maintaining oil contaminants (primarily water and particulates which may be indicative of in-leakage and corrosion product buildup) within acceptable limits to preserve an operating environment that is not conducive to loss of material, cracking, or heat transfer degradation.

Staff Evaluation. During its audit, the staff confirmed the applicant's claim of consistency with the GALL Report. LRA Section B2.1.24 provides the applicant's program description, statement of consistency with the GALL Report, OE, and its conclusion that the PINGP Lubricating Oil

Analysis AMP will provide reasonable assurance that loss of material will be adequately managed through the period of extended operation. The applicant stated that the Lubricating Oil Analysis Program is consistent with the 10 elements of AMP XI.M39, “Lubricating Oil Analysis," with no exceptions or enhancements.

During the on-site review, the staff reviewed documents supporting the applicant’s conclusion that the program elements are consistent with the elements in the GALL AMP. Based on its review, the staff determined that the program elements for the applicant’s Lubricating Oil Analysis Program are consistent with the program elements of GALL AMP XI.M39. Based on this review, the staff finds that the program elements for the applicant’s Lubricating Oil Analysis Program acceptable.

Operating Experience. The applicant stated that the Lubricating Oil Analysis program has been effective in preventing component failures due to oil contamination or degradation. The applicant noted that in some instances where oil samples contained water or particulate contamination in excess of the established limits, appropriate actions were taken in accordance with the Corrective Action Program to correct the identified conditions, and no instances of component failures attributed to lubricating oil contamination or degradation have been identified.

The applicant also stated that the management of aging effects is achieved through objective evidence showing that aging effects/mechanisms are being adequately managed consistent with the CLB for the period of extended operation.

The staff audited the OE reports, including a sample of CRs available in the Corrective Action Program, and interviewed the applicant’s technical staff. This staff noted that the CRs did not include any reports where wear or equipment failure had resulted because of poor lubricating oil quality, which is an indication of the effectiveness of the applicant’s Lubricating Oil Analysis.

The staff noted that the documentation provided by the applicant during the onsite review supports the applicant’s statements regarding OE and confirmed 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 in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. The applicant provided its UFSAR Supplement for the Lubricating Oil Analysis Program in LRA, Appendix A, Section A2.24. The staff verified that provisions of the UFSAR Supplement for the Lubricating Oil Analysis Program is in conformance with the recommended UFSAR Supplement summary description for Lubricating Oil Analysis Programs in SRP-LR, Tables 3.3.1-2, 3.2-2, 3.3-2 and 3.4-2. Based on this review, staff finds that the applicant’s UFSAR Supplement for the Lubricating Oil Analysis Program is acceptable.

The staff finds that the UFSAR Supplement for the Lubricating Oil Analysis Program provides an adequate summary description of the program as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review Lubricating Oil Analysis 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).

3.0.3.1.15 Masonry Wall Program

Summary of Technical Information in the Application. LRA Section B2.1.25 describes the existing Masonry Wall Program as consistent with 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 operation.

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 steel supports and steel bracing of masonry walls in-scope of license renewal are inspected as part of the Structures Monitoring Program. The applicant also stated that 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 associated basis documents to determine whether the AMP remains adequate to manage the aging effects for which it is credited in the LRA.

The staff interviewed the applicant's technical staff and reviewed those portions of the Masonry Wall Program for which the applicant claims consistency with GALL AMP XI.S5.

During its review, the staff asked 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 on its review, the staff finds the Masonry Wall Program consistent with the program elements of GALL AMP XI.S5, and therefore acceptable.

Operating Experience. The staff reviewed the OE provided in LRA Section B2.1.25, and Operation Experience Review Report (Masonry Walls 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 discussed in the LRA, has been effective in identifying, monitoring, and correcting the aging effects on 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 A2.25, "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 finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.16 Metal-Enclosed Bus

Summary of Technical Information in the Application. LRA Section B2.1.26 describes the Metal-Enclosed Bus Program as a new program that is consistent with GALL AMP XI.E4, "Metal-Enclosed Bus." The applicant states the Metal-Enclosed Bus Program is a condition-monitoring program that inspects representative samples of the interiors of non-segregated 4160V phase bus between station offsite source auxiliary transformers and plant buses. The applicant also states that the inspection may include thermography and/or electrical resistance testing to ensure the integrity of bus connections. The program manages the aging effect of reduction of insulation resistance in insulation components, loose connections, and corrosion from moisture or debris intrusion in non-segregated bus ducts. In addition, the applicant states that the interior visual inspection will be conducted at least once every five years, or, if conducted with thermography or electrical resistance testing, at least once every 10 years. The applicant further states that the first inspections and/or tests will be completed before the period of extended operation.

Staff Evaluation. During the audit, the staff reviewed the applicant's claim of consistency with the GALL Report. In LRA Section B2.1.26, the applicant claims that its Metal Enclosed Bus (MEB) program is consistent with GALL AMP XI.E4. The scope of program in GALL AMP XI.E4 is to inspect all MEBs within the scope of program and a sample of accessible bolted connections. In AMP B2.1.26, the applicant will only inspect representative samples of MEBs within the scope license renewal. In a letter dated November 5, 2008 (RAI B2.1.26-1), the staff requested the applicant to explain how the scope of applicant's MEB program is consistent with that in the GALL AMP X1.E4. In response to the staff's request, in a letter dated December 5, 2008, the applicant stated that to be consistent with NUREG-1801 Program XI.E4, LRA Sections A2.26 and B2.1.26 are revised as follows:

> In LRA Section A2.26, "Metal Enclosed Bus Program," on Page A-11, the first paragraph is revised by deleting the words "representative samples of" from the second line.
>
> In LRA Section B2.1.26, "Metal Enclosed Bus Program," on Page B-57, the Program Description is revised in its entirety to read as follows:
>
> "The Metal-Enclosed Bus Program is a condition monitoring program that inspects the interiors of non-segregated 4160V phase bus between station offsite source auxiliary transformers and plant buses. Internal visual inspection is performed to observe signs of aging of the bus insulation materials such as cracking and discoloration, evidence of loose connections, and signs of moisture and debris intrusion. Internal bus supports are visually examined for structural integrity and signs of cracks. The inspection may also include thermography and/or electrical resistance testing to ensure the integrity of bus connections. The program manages the aging effect of reduction of insulation resistance in insulation components, loose connections, and corrosion from moisture/debris intrusion in non-segregated bus ducts. The scope of the Metal-Enclosed Bus Program applies to MEB within the scope of license renewal. The internal portion of the MEB will be visually inspected every 10 years. For bolted connections, a sample of accessible bolted connections will be checked for loose connection by thermography, resistance measurement, or by an alternative internal bolted connection visual inspection to detect surface anomalies of the insulating material covering the connection. If selected, the loose connection thermography or resistance measurement will be performed every 10 years, or if selected, an alternative internal bolted connection visual inspection will be performed every 5 years. The first inspections and tests will be completed before the period of extended operation."

The staff finds the applicant’s response acceptable because with the proposed LRA amendment as described above, the scope of the applicant’s Metal Enclosed Bus Program is now consistent with that in GALL AMP XI.E4, because it includes all metal enclosed buses within the scope of license renewal. These MEBs include non-segregated 4160 V phase bus between station offsite source auxiliary transformers and plant buses. The staff also finds that the program description is consistent with that in the GALL AMP XI.E4.

GALL AMP XI.E4, Metal Enclosed Bus Program, will provide for inspection of the interior of MEBs and GALL AMP XI.S6, Structure Monitoring Program, will inspect the exterior of the enclosure assembly. In PINGP AMP B2.1.26, under program element 3 (parameters monitored/inspected), the applicant stated that AMP B2.1.26 will inspect both the exterior and interior of MEBs such as housings and housing seals. This appeared to be an exception to GALL Report. In a letter dated November 5, 2008 (RAI B2.1.26-2), the staff requested the applicant to explain why this is not an exception to the GALL Report XI.E4 and provide technical basis for this exception. In response to the staff’s request, in the letter dated December 5, 2008, the applicant stated that LRA Section B2.1.38, the Structures Monitoring Program, provides for periodic MEB inspections to monitor the exterior condition of the enclosure assembly steel and elastomers. The applicant further stated that both the PINGP MEB Program and the Structures Monitoring Program (with enhancement) are consistent with the GALL Report. The applicant also stated that, as a rule, including activities in an AMP that exceed the minimum standards for that program in NUREG-1801 would not be considered an exception to NUREG-1801. However, for clarity, the applicant stated that the program basis document for the MEB Program has been revised to delete external inspection statements from its scope.

The staff finds the applicant's response acceptable because the applicant has revised the program basis document for the MEB program to delete external inspection from its scope. These inspections are performed under the Structure Monitoring Program, which is consistent with those in the GALL AMP XI.S6.

Under element 3 (parameters monitored/inspected), GALL AMP XI.E4 states that the internal bus support will be inspected for structural integrity and signs of cracks. In PINGP AMP B2.1.26, the applicant did not include inspection of internal bus supports. In a letter dated November 5, 2008 (RAI B2.1.26-3), the staff requested the applicant to explain why the internal bus supports were not included in this element. In response to the staff's request, in a letter dated December 5, 2008, the applicant stated that in PINGP LRA Appendix B2.1.26, the Metal-Enclosed Bus Program includes visual inspection of the internal bus supports for structural integrity and signs of cracks. The applicant further stated that the Program Basis Document for MEB has been revised to explicitly list the inspection of internal bus supports for structural integrity and signs of cracks in the discussion for Element 3. The staff finds the applicant's response acceptable because the revised basis document includes inspection of the internal bus support for structural integrity, the applicant MEB Element 3 is now consistent with that in the GALL AMP XI.E4 (i.e., parameters monitored/inspected).

Under program element 6 (Acceptance Criteria), the GALL AMP XI.E4 states that bolted connections need to be below the maximum allowed temperature for the application when thermography is used or a low resistance value appropriate for the application when resistance measurement is used. MEBs are to be free from unacceptable visual indications of surface anomalies, which suggest that conductor insulation degradation exists. In addition, no unacceptable indication of corrosions, cracks, foreign debris, excessive dust buildup or evidence of moisture intrusion is to exist. In the same program element, the applicant states that the acceptance criteria for each inspection and test is defined by the specific type of test performed. The staff noted that acceptance criteria of the program and its base should be described. The acceptance criteria, against which the need for correction 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 applicant has not described acceptance criteria for program Element 6 of AMP B2.1.26. In a letter dated November 5, 2008 (RAI B2.1.26-4), the staff requested the applicant to describe acceptance criteria for each inspection and/or test and compare these acceptance criteria against those in GALL AMP XI.E4. In response to the staff's request, in a letter dated December 5, 2008, the applicant stated that the Program Basis Document for the Metal Enclosed Bus Program has been revised to clarify the intent of the acceptance criteria. The applicant also stated that thermography inspection acceptance criterion for bolted connections are to maintain temperatures below the maximum allowed temperature for the application. When resistance measurement is performed, a low resistance acceptance value is used, appropriate for the application. MEB manufacturer design information may be used as a basis for acceptance criteria. For the alternative internal bolted connection visual inspection, the acceptance criteria for insulated bolted connections are to be free from unacceptable visual indications of surface anomalies, which suggest that conductor insulation degradation exists. The applicant further stated that when the alternative visual inspection for bolted connections is used, the absence of discoloration, cracking, chipping or surface contamination will provide positive indication that the bolted connections are not loose. For the internal visual inspection, the applicant stated that the acceptance criteria would be no unacceptable indication of corrosion, cracks, foreign debris, excessive dust buildup, or evidence of moisture intrusion. Internal bus supports are visually inspected for indication of reduced structural integrity and signs of cracks. The applicant also stated that an unacceptable indication is defined as a noted condition or situation that, if left un-managed, could lead to a loss of intended function.

The staff reviewed the information provided and found the applicant's response acceptable because the applicant has revised the program basis document to describe the acceptance criteria for each inspection and/or testing. This should ensure that the component intended function(s) are maintained consistent with the CLB. In addition, the acceptance criteria described above are consistent with GALL AMP XI.E4, Element 6 (Acceptance Criteria).

Based on its review, including the applicant's response to staff's RAI numbers B2.1.26-1, 2, 3, and 4, the staff finds that the applicant's MEB Program is consistent with the program elements of GALL AMP XI.E4, and therefore acceptable.

<u>Operating Experience</u>. The staff reviewed the OE described in LRA B2.1.26. In LRA Section B2.1.26, the applicant states that the Metal Enclosed Bus Program is a new program, and, therefore, it has no OE related to program implementation. The applicant performed a review of plant OE which reveals that previous periodic inspections of bus ducts have identified degraded components that were repaired/replaced to prevent electrical failures. In the plant basis documents, the applicant states that past inspections discovered corroded interior parts of metal-enclosed bus sections in the 1MX/1MY Bus Duct as a result of moisture intrusion, and expanded the scope of inspection to internal electrical components in other metal-enclosed bus ducts having the same configuration and environments (outdoors). The staff reviewed a CR investigating the root cause for the 1MX/1MY degradation and verified that the applicant appropriately identified the root causes and took appropriate corrective actions to address bus duct degradation issues

The staff reviewed the OE provided in the LRA and in the basis documents that were available during the audits. Based on the review of the industry and applicant-identified OE, the staff has confirmed that the applicant has addressed OE related to this program, and has identified the applicable aging effects, i.e., moisture or debris buildup internal to the metal enclosed bus, which are the aging effects identified by the GALL Report for this program. Therefore, the staff determines that the applicant has adequately addressed this element. The staff confirmed that the OE program element satisfies the criteria defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Appendix A, Section A2.26, the applicant provided the UFSAR supplement for the AMP Metal Enclosed Bus Program. The staff reviewed this section and

determined that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

The applicant committed to implement this AMP prior to the period of extended operation and identified it as LRA Commitment No. 20.

Conclusion. On the basis of its review of the applicant's Metal Enclosed Bus Program, including the applicant's responses to RAIs B2.1.26-1, 2, 3, and 4, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.17 Nickel Alloy Nozzles and Penetrations

Summary of Technical Information in the Application. In the PINGP LRA Section B2.1.27, the applicant commits to comply with applicable NRC orders, and implement applicable NRC Bulletins, Generic Letters, and staff-accepted industry guidelines in to manage cracking due to primary water stress corrosion cracking (PWSCC). In this LRA Section, the applicant's stated that AMP B2.1.27 is a new program that will be implemented before the period of extended operation.

By letter dated March 27, 2009, the applicant amended the Nickel-Alloy Nozzles and Penetrations Program to redefine the program as an existing plant-specific AMP for the LRA that incorporates the ten program elements for AMPs, as recommended in SRP-LR Appendix A, Section A.1.2.3, and to delete the commitment in the previous version of the AMP and its Commitment No. 21 from the LRA.

Staff Evaluation. The staff noted that the original version of the applicant's Nickel-Alloy Nozzles and Penetration Program indicated that the program will comply with all NRC Orders Generic Letters, and Bulletins related to PWSCC of nickel-alloys, and that the applicant reflected these activities as an LRA enhancement that is defined in LRA Commitment No. 21,

The staff also noted that by letter dated March 27, 2009, the applicant amended AMP B2.1.27, Nickel-Alloy Nozzles and Penetrations Program, to redefine the program as an existing plant-specific AMP for the LRA that incorporates the ten program elements for AMPs, as recommended in SRP-LR Appendix A, Section A.1.2.3, and to delete the commitment in the previous version of the AMP and in Commitment No. 21 from the scope of the LRA.

The staff evaluates the amended Nickel-Alloy Nozzles and Penetrations Program and the plant-specific program elements for this AMP in SER Section 3.0.3.3.1.

Operating Experience. In LRA Section B2.1.27, the applicant committed to comply with applicable NRC orders, and implement applicable NRC Bulletins, Generic Letters, and staff-accepted industry guidelines with regard to nickel-alloy components. However, no OE with regard to nickel-alloy components was provided in LRA Section B2.1.27. The staff issued RAI

B2.1.27-1, dated December 5, 2008, to request plant-specific OE with regard to nickel-alloy components other than those of the closure head.

The staff also noted that by letter dated March 27, 2009, the applicant amended AMP B2.1.27, Nickel-Alloy Nozzles and Penetrations Program, to redefine the program as an existing plant-specific AMP for the LRA that incorporates the ten program elements for AMPs, as recommended in SRP-LR Appendix A, Section A.1.2.3, and to delete the commitment in the previous version of the AMP and in Commitment No. 21 from the scope of the LRA.

The staff element for the amended Nickel-Alloy Nozzles and Penetrations Program in SER Section 3.0.3.3.1.

UFSAR Supplement. The applicant provided its UFSAR Supplement for the Nickel-Alloy Nozzles and Penetrations Program in PINGP LRA, Appendix A, Section A2.27. The staff verified that provisions of the UFSAR Supplement are acceptable because these provisions are in accordance with SRP-LR, Tables 3.X-2, Nickel-Alloy Nozzles and Penetrations.

In a letter dated March 27, 2009, the applicant amended the LRA UFSAR Supplement A2.27 to (1) delete LRA Commitment No. 21 on UFSAR Supplement summary description A2.27 from the scope of the LRA, and (2) reflect the new augmented inspection activities and requirements for the non-upper RVCH penetration nozzle ASME Code Class 1 nickel-alloy components. The staff's evaluation of the amended UFSAR Supplement summary description A2.27 for the Nickel-Alloy Nozzles and Penetration Program is given in SER Section 3.0.3.3.1.

Conclusion. The staff's conclusion on the acceptability of AMP B2.1.27, Nickel-Alloy Nozzles and Penetrations Program and on the acceptability of the amended UFSAR Supplement summary description for this program are given in SER Section 3.0.3.3.1.

3.0.3.1.18 One-Time Inspection

Summary of Technical Information in the Application. LRA Section B2.1.29 describes the new One-Time Inspection Program as consistent with GALL AMP XI.M32, "One-Time Inspection." The applicant stated that the One-Time Inspection Program provides additional assurance, through sampling inspections using nondestructive examination (NDE) techniques, that aging is not occurring or that the rate of degradation is so insignificant that additional aging management actions are not needed. The applicant also stated that the program includes measures to verify the effectiveness of other AMPs, such as the Water Chemistry Program, in mitigating aging effects and, in other cases, to confirm that a separate AMP is not needed when significant aging is not expected to occur. The applicant further stated that if aging effects are identified that could adversely impact an intended function prior to the end of the period of extended operation, additional actions will be taken to correct the condition, perform additional inspections, and perform periodic inspections, as needed. Elements of the One-Time Inspection Program include the following: (a) determination of the sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and OE; (b) identification of inspection locations in the system, component, or structure based on the aging effect; (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect being examined; and (d) evaluation of the need for follow-up examination if degradation is identified that could jeopardize an intended function prior to the end of the period of extended operation. The applicant stated that the program must be implemented prior to the period of extended operation, should rely only on results of inspections performed within the 10-year period preceding the period of extended operation, and expires at the time of entry into the period of extended operation.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's program basis document, on-site procedures, CRs, and other plant documents that were included in the applicant's license renewal program basis document binder for the One-Time Inspection Program and that contained relevant information supporting the applicant's evaluation of this AMP.

In the program basis document the applicant stated that the One-Time Inspection Program relies upon established nondestructive examination (NDE) techniques of the ASME Code Section XI Inservice Inspection Program or may use alternate NDE techniques not specified by ASME Code Section XI, if appropriate. The applicant stated that sampling approaches at other sites holding renewed licenses will be considered, including the methodology discussed in EPRI TR-107514, "Age-Related Degradation Inspection Methods and Demonstration," which was cited by the applicant as one industry source to be considered in developing the One-Time Inspection Program.

The staff noted that the applicant's One-Time Inspection Program includes inspections to verify the effectiveness of the Water Chemistry Program to mitigate aging effects with emphasis on low flow/stagnant piping areas; to verify the effectiveness of the Fuel Oil Chemistry Program to mitigate aging effects with emphasis on low flow/stagnant areas of piping and tank bottoms associated with fuel oil storage and delivery systems; and to verify the effectiveness of the Lubricating Oil Analysis Program to ensure that water and other contaminants are not present in tanks or vessels containing lubricating oil.

The staff noted that potential aging effects monitored or inspected by the applicant's One-Time Inspection Program are loss of material due to corrosion, cracking due to SCC or intergranular stress corrosion cracking (IGSCC), and heat transfer reduction due to fouling; and the applicant's program uses visual examinations and other NDE techniques, including those inspection methods specified in the ASME Code Section XI, to inspect components on a sampling basis for signs of degradation due to aging. The staff also noted that examinations rely on qualified inspectors, using acceptance criteria and evaluation techniques consistent with the ASME Code; and when alternate inspection methods not included in ASME Code Section XI are used, the One-Time Inspection Program includes documentation to specify the components to be examined, the examination techniques, acceptance criteria, flaw evaluation requirements, and technical justification of suitability to detect the aging effect of interest. Although site implementing procedures for the One-Time Inspection Program have not currently been issued, the staff noted that the applicant's program basis document states that NDE techniques for detecting a specific aging effect will be consistent with the examples listed in GALL AMP XI.M32 (e.g., VT-3 or equivalent and/or volumetric to detect microbiological influenced corrosion). The staff finds that these features of the One-Time Inspection Program are consistent with recommendations in GALL AMP XI.M32.

The staff compared program's elements in the applicant's program to those in GALL AMP XI.M32 and found that the program elements in the AMP, which the applicant claims to be consistent with the GALL Report are consistent with the corresponding program element criteria recommended in GALL AMP XI.M32. The staff's reviewer did not identify any differences between recommendations in the GALL Report and the applicant's consistency claims.

In its April 11, 2008, LRA submittal letter, and again in its letter of January 20, 2009, the applicant provided a list of "Preliminary License Renewal Commitments." This list includes Commitment No. 23 stating that a One-Time Inspection Program, with program features as described in the LRA, will be completed. The implementation schedule for this commitment is prior to the period of extended operation for each of the applicant's nuclear units. The LRA describes the applicant's One-Time Inspection Program as consistent with GALL AMP XI.M32 with no exceptions. Because this commitment provides assurance that the applicant will implement a One-Time Inspection Program consistent with the recommendations for GALL AMP XI.M32 prior to the period of extended operation, the staff finds this commitment to be acceptable.

Based on its review, the staff finds the One-Time Inspection Program consistent with the program elements of GALL AMP XI.M32, and therefore acceptable.

Operating Experience. In LRA Section B2.1.29, the applicant stated that the One-Time Inspection Program is a new program and there is no OE related to program implementation. The applicant also stated that both plant and industry OE will be used to establish sample size, inspection locations, and examination techniques for inspections under this program.

The staff noted that although the applicant has no experience with the One-Time Inspection Program, the applicant does have related OE using the NDE techniques implemented by that program. During the on-site audit, the staff reviewed OE and selected corrective action reports that demonstrate the applicant's ability to perform various NDEs, such as visual examinations, enhanced visual examinations, and ultrasonic examinations, that are used in the One-Time Inspection Program. The staff confirmed that for existing condition monitoring programs, the applicant has demonstrated capability to detect indications of degradation, and to take appropriate corrective actions based on the indications that have been found. The applicant's One-Time Inspection Program is a new one-time condition-monitoring program for a select number of components in the plant that has yet to be implemented at the facility. Since the applicant has demonstrated that its current existing condition monitoring programs have the ability to detect the aging effects for which it is credited and since the staff has verified that the program elements of this AMP are consistent with those in AMP XI.M32, "One-Time Inspection,“ the staff finds that the applicant's One-Time Inspection Program, when implemented, will be capable of identifying the aging effects for which the AMP is credited and for taking appropriate corrective actions under the applicant's 10 CFR Part 50, Appendix B Quality Assurance Program if aging is detected through implementation of the program.

Based on this review, the staff finds that the applicant's One-Time Inspection Program will be capable of achieving its objective of verifying the effectiveness of other AMPs and of confirming that age-related degradation is not occurring or is occurring very slowly so as not to affect component or structure intended functions during the period of extended operation, and of taking appropriate corrective actions when indications of degradation are detected as a result of implementation of the AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A2.29, the applicant provided the UFSAR supplement for the One-Time Inspection Program. The staff verified that the UFSAR supplement summary for the One-Time Inspection Program conforms with the staff's recommended UFSAR supplement for this type of program as described in the SRP-LR.

In its letter dated April 13, 2009, the applicant provided a list of License Renewal Commitments. The staff verified that the applicant has included completion of the One-Time Inspection Program prior to the period of extended operation as Commitment No. 23 of the final list of License Renewal Commitments.

Based on this review, the staff finds that the UFSAR supplement summary in LRA Section A2.29 provides an acceptable description of the applicant's One-Time Inspection Program because it is consistent with the UFSAR supplement summary description recommended in the SRP-LR for the One-Time Inspection program.

The staff determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's One-Time Inspection Program, the staff finds all program elements consistent with the GALL Report. In addition, the staff confirms that license renewal Commitment No. 23 will ensure that the One-Time Inspection Program is completed 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).

3.0.3.1.19 One-Time Inspection of ASME Code Class 1 Small Bore Piping

Summary of Technical Information in the Application. LRA section B2.1.30 describes the new One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program" as consistent with GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping." The applicant stated that this one-time inspection is a condition-monitoring program that provides additional assurance that aging of Class 1 small-bore piping either is not occurring or is insignificant, such that a new plant-specific AMP is not warranted.

The applicant stated that the program inspects for the presence of cracking by performing one-time volumetric examinations on a small sample of butt welds in Class 1 piping less than 4-inch nominal pipe size. The applicant also stated that one-time inspections are performed at locations that are determined to be potentially susceptible to cracking, on the basis of the methodology of the site-specific, NRC approved, risk informed inservice inspection program. The applicant further stated that if evidence of aging-related cracking is identified by this one-time inspection program, a periodic inspection program will be implemented to manage applicable aging effects during the period of extended operation.

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.M35, 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.M35. The staff also confirmed that the plant program contains all of the elements of the referenced GALL AMP. On-site interviews were also held to confirm these results.

Based on its review, the staff finds the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program consistent with the program elements of GALL AMP XI.M35, and therefore acceptable.

Operating Experience. The staff reviewed the OE described in LRA Section B2.1.30 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 that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program is a new program, and therefore, has no OE related to program implementation. The applicant also stated that both plant and industry OE will be used to establish the program. The applicant stated that the specific examination techniques utilized will be qualified prior to performing the examinations.

In LRA Section B2.1.30, the applicant stated that it had conducted 41 UT examinations of ASME Class 1 and 2 small-bore piping welds during the 2007 refueling outages at Units 1 and 2. The applicant stated that it had not detected any rejectable indications in either Unit 1 or Unit 2.

Based upon a review of previous OE, the staff determined that the applicant has not identified any cracking of ASME Code Class 1 small-bore piping. Furthermore, the staff verified that the applicant has addressed OE identified after the issuance of the GALL Report. Based on its review, the staff finds that the applicant's One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program can be expected to ensure that effects of aging will be adequately managed during the period of extended operation because plant and industry OE will be considered in developing the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program and the specific examination techniques utilized will be qualified prior to performing the examinations.

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 A2.30, the applicant provided the UFSAR supplement for the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program. The staff verified that the UFSAR supplement summary description for the One-Time Inspection of ASME Code

Class 1 Small-Bore Piping Program was in conformance with the staff's recommended UFSAR supplement for these types of programs provided in Table 3.1-2 of the SRP-LR.

In its letter dated April 13, 2009, the applicant provided a list of License Renewal Commitments. The staff verified that the applicant has included Commitment No. 24 in the License Renewal Commitment List, which states that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program will be implemented prior to the period of extended operation.

Based on this review, the staff determines that UFSAR supplement Section A2.30 provides an acceptable UFSAR supplement summary description of the applicant's One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program because it is consistent with those UFSAR supplement summary description in the SRP-LR for One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program.

The staff determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis on its review of the applicant's One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function 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).

3.0.3.1.20 Open-Cycle Cooling Water System

Summary of Technical Information in the Application. LRA Section B2.1.31 describes the existing Open-Cycle Cooling Water (OCCW) Program as consistent with GALL AMP XI.M20, "Open-Cycle Cooling Water System." The applicant stated that the Open-Cycle Cooling Water System Program implements the commitments made in its response to NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," to ensure that the effects of aging in OCCW systems, and in components serviced by the OCCW systems, will be managed for the period of extended operation. The applicant also stated that this program manages aging effects associated with metallic components exposed to a raw water environment. The aging effects managed by this program are corrosion, erosion, and fouling (including silting and coating failure). The applicant further stated that the program includes routine inspections and maintenance activities, tests to verify heat transfer capabilities, and surveillance and control of fouling.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's program basis document, on-site procedures, corrective action reports, and other plant documents that were included in the applicant's license renewal program basis document binder for the Open-Cycle Cooling Water System Program and that contained information supporting the applicant's evaluation of this AMP.

The staff noted that the applicant's Open-Cycle Cooling Water System Program manages aging effects in components exposed to a raw water environment and serviced by the open-cycle cooling water system. The staff also noted that the applicant credits the AMP with managing aging effects of loss of material due to general, pitting, crevice, and galvanic corrosion, due to MIC, and due to erosion, and heat transfer degradation due to fouling. The staff noted that the AMP uses periodic visual inspections to check for degradation of protective coatings and for silting and includes use of chemical control and periodic visual inspections to reduce incidents of flow blockage due to microscopic or macroscopic biofouling. It manages heat exchanger performance through performance testing, inspections and cleaning performed through either periodic surveillance testing or preventive maintenance procedures. It also uses periodic eddy current testing (ECT) to trend and evaluate operation of balance of plant heat exchangers. The staff finds these features of the applicant's AMP to be consistent with recommendations in GALL AMP XI.M20.

The staff also noted that the applicant's open-cycle cooling water systems are constructed of various materials, including carbon steel, cast iron, copper alloy, copper-nickel, brass, bronze, and stainless steel. The cooling water headers and certain heat exchanger components also have a protective coating applied. The staff noted that periodic cleaning and system flushing is used to remove accumulations of fouling agents, corrosion products and silt, and the applicant's Open-Cycle Cooling Water System Program follows the guidance of NRC GL-89-13. The staff confirmed that inspection scope, methods, and testing frequencies are in accordance with the applicant's commitments made in response to NRC GL 89-13. The staff finds these aspects of the applicant's AMP to be consistent with recommendations in GALL AMP XI.M20.

The staff compared program elements in the applicant's program to those in GALL AMP XI.M20 and found that the program elements in the AMP that the applicant claims to be consistent with the GALL Report are consistent with the corresponding program element criteria recommended in GALL AMP XI.M20. The staff did not identify any differences between recommendations in the GALL Report and the applicant's consistency claims.

Based on its review, the staff finds the Open-Cycle Cooling Water System Program consistent with the program elements of GALL AMP XI.M20, and therefore acceptable.

Operating Experience. The staff reviewed the OE described in LRA Section B2.1.31. The applicant stated that a review of OE for the Open-Cycle Cooling Water System Program identified no adverse trends or issues with program performance. The applicant also stated that the review revealed a number of examples where equipment issues have been identified and are being managed under the Open-Cycle Cooling Water System Program, including accumulations of silt, corrosion products, and debris in cooling water piping, valves, and heat exchangers; accumulation of biological growth (mussels, clams, and shells) in river cooling water piping and intake bays; instances of MIC causing pitting attack of cooling water pipe; and instances of heat exchanger tubes requiring plugging due to corrosion. The applicant further stated that the conditions were identified and corrected prior to causing a significant impact to safe operation or loss of intended functions.

The staff reviewed the OE discussion that was provided in the applicant's license renewal program basis document binder for the Open-Cycle Cooling Water System Program. The staff confirmed that the applicant's review of OE included evaluation of both industry and plant-specific events that have occurred since issuance of the GALL Report, Revision 1. The staff reviewed additional selected corrective action reports (ARs) related to the applicant's Open-Cycle Cooling Water System Program and interviewed the applicant's subject matter experts for the Open-Cycle Cooling Water System Program. The staff also reviewed specific corrective action reports including ones where the applicant found low wall thickness due to loss of material, corrosion deposits attributed to MIC attack in piping, and heat exchanger fouling. The staff noted that for all of these examples, the applicant's Open-Cycle Cooling Water System Program demonstrated its capability to identify, evaluate and correct age-related degradation for components and equipment within the scope of the program. Based on its review of the plant-specific OE, the staff confirmed that the applicant's program has demonstrated capability to detect the aging effects which it is credited to manage, and when the program has detected indications of aging, it has implemented corrective actions adequate to prevent loss of license renewal intended function in the affected components.

Based on this review, the staff finds (1) that the OE for this AMP demonstrates that the applicant's Open-Cycle Cooling Water System Program has implemented the recommendations of NRC GL 89-13 and is effective in managing aging effects due to biofouling, corrosion, erosion, and fouling due to protective coating failures and silting in components serviced by the open-cycle cooling water system, and (2) that the applicant is taking appropriate corrective actions when deficiencies are found through implementation of this program.

UFSAR Supplement. In LRA Section A2.31, the applicant provided the UFSAR supplement for the Open-Cycle Cooling Water System Program. The staff verified that the UFSAR supplement summary for the Open-Cycle Cooling Water System Program conforms with the staff's recommended UFSAR supplement for this type of program as described in the SRP-LR.

Based on this review, the staff finds that the UFSAR supplement summary in LRA Section A2.31 provides an acceptable description of the applicant's Open-Cycle Cooling Water System Program because it is consistent with the UFSAR supplement summary description recommended in the SRP-LR for an 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. On the basis of its audit and review of the applicant's Open-Cycle Cooling Water System Program, the staff finds that all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.21 PWR Vessel Internals

Summary of Technical Information in Application. The applicant addressed the PINGP, Units 1 and 2 PWR Vessels Internals Program in Appendix B (B2.1.32) of the LRA. For the PWR Vessels Internals Program, the applicant committed to the following activities for managing the aging of RPV internal components:

(1) participate in the industry programs for investigating and managing aging effects on reactor internals;

(2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and

(3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan on reactor internals to the NRC for review and approval.

The applicant has also included this commitment as Commitment No. 25 to LRA Appendix A (UFSAR supplement).

In a letter dated May 12, 2009, the applicant submitted a change to AMP B.2.1.32, that deleted the original version of the PWR Vessel Internals Program and that instead replaced the original program with a plant-specific PWR Vessel Internals Program that is defined in terms of the 10 program elements for AMPs that are defined in SRP-LR, Appendix A1, Section A.1.2.3. In the letter of May 12, 2009, the applicant also replaced Commitment No. 25 with the following plant-specific commitment for the PWR Vessel Internals Program, as placed on LRA Appendix A, Section A.

(a) A PWR Vessel Internals Program will be implemented. Program features will be as described in LRA Section B2.1.32.

(b) An inspection plan for reactor internals will be submitted for NRC review and approval at least twenty-four months prior to the period of extended operation.

<u>Staff Evaluation</u>. The staff received the applicant's amended plant-specific PWR Vessel Internals Program and the associated changes to LRA Commitment No. 25 in letter dated May 12, 2009. Due to its recent submittal, the staff has not yet had ample time to review the new, plant-specific program elements for the applicant's AMP against the recommendations and criteria for AMP program elements that are defined in SRP-LR, Appendix A.1, Section A.1.2.3. However, since the acceptability of the PWR Vessel Internals Program is pending the results of the staff's review of the AMP's program elements, the staff's acceptance of the PWR Vessel Internals Program is remains open. The staff will document its review of the program elements for the PWR Vessel Internals Program in the UFSAR for the application. This is **Open Item 3.0.3.1.21-1, Part 1**.

<u>UFSAR Supplement</u>. The applicant provided an UFSAR supplement summary description of its PWR Reactor Internals Program in LRA Appendix A2.32.

The staff verified that the applicant's UFSAR Supplement includes Commitment No. 25 that was issued on the PWR Vessel Internals Program and that was revised in the applicant's letter of May 12, 2009. Due to its recent submittal, the staff has not yet had ample time to review the changes that were made to LRA Commitment No. 25. However, since the acceptability of the PWR Vessel Internals Program is pending the staff's review of the revisions to LRA Commitment No. 25, the staff's acceptance of LRA Appendix A2.32 and of LRA Commitment No. 25 remains open. This is **Open Item 3.0.3.1.21-1, Part 2**.

Conclusion. Based on the staff's review as discussed in the above evaluation, pending acceptable resolution of Open Item **3.0.3.1.21-1, Part 1**, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(a)(3), that PWR Vessels Internals Program will adequately manage the aging effects in RPV internals components for the period of extended operation. The staff also concludes that, pending acceptable resolution of Open Item **3.0.3.1.21-1, Part 2** the UFSAR supplement contains an appropriate summary description of the PWR Vessels Internals AMP, as required by 10 CFR 54.21(d).

3.0.3.1.22 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)

Summary of Technical Information in Application. The thermal aging embrittlement of Cast Austenitic Stainless Steel (CASS) program manages the loss of fracture toughness due to thermal aging embrittlement of CASS components, other than pumps casings and valve bodies that are exposed to reactor coolant operating temperatures. The applicant states that this program augments the PINGP ASME Code, Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. According to the applicant, the CASS pump casings and valve bodies are excluded from screening for susceptibility to thermal aging based on the assessment documented in the letter dated May 19, 2000, from Christopher Grimes, NRC, to Douglas Walters, Nuclear Energy Institute (NEI), "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components." The CASS pump casings and valve bodies are adequately addressed by existing ASME Code, Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program requirements.

The applicant states that the thermal aging embrittlement of CASS Program is a new AMP for PINGP and that this program will be consistent with the recommendations of the GALL Report, Chapter XI, XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)." The applicant claims no exceptions to the GALL Report and states that the program will be implemented prior to the period of extended operation.

Staff Evaluation. The staff reviewed LRA Appendix B2.1.39 to verify, pursuant to 10 CFR 54.21(c)(1)(iii), that the thermal aging embrittlement of CASS Program will adequately manage the aging effects in CASS components for the period of extended operation.

According to the GALL Report, Chapter XI, XI.M12, reactor coolant system components are inspected in accordance with the ASME Code, Section XI. This inspection will be augmented to detect the effects of loss of fracture toughness due to thermal aging embrittlement of CASS components. The CASS AMP includes: (a) determination of the susceptibility of CASS components to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite, and (b) for potentially susceptible components, aging management is accomplished through either enhanced volumetric examination or plant or component-specific flaw tolerance evaluation. Additional inspection or evaluations to demonstrate that the material has adequate fracture toughness are not required for components that are not susceptible to thermal aging embrittlement. The applicant has stated that the subject AMP is new to PINGP and that this program will be consistent with the recommendations of the GALL Report, Chapter XI, XI.M12.

Based on the staff's review of the applicant's AMP description as provided in LRA Appendix B2.1.39, the staff finds the program will provide reasonable assurance that aging effects will be managed such that the CASS components within the scope of the program will continue to perform their intended function(s) during the period of extended operation.

Operating Experience. In LRA Section B2.1.39, the applicant stated that the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program is a new program to be implemented prior to the period of extended operation, and therefore, it has no OE related to program implementation. GALL AMP XI.M12 states that the CASS Program was developed by using research data obtained on both laboratory-aged and service-aged materials.

The staff noted that the applicant has conducted evaluations and analyses to identify which CASS components are susceptible to thermal aging embrittlement and that program development is continuing. The staff confirmed 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 A2.39, the applicant provided the UFSAR supplement for the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program. The staff verified that the UFSAR supplement summary description for the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program was in conformance with the staff's recommended UFSAR supplement for these types of programs provided in Table 3.1-2 of the SRP-LR.

On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the thermal embrittlement of CASS program for managing the aging effects of CASS components is adequate.

Conclusion. Based on the staff's review as discussed in the above evaluation, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the Thermal Aging Embrittlement of Cast Austenitic Stainless Steels Program will adequately manage the aging effects CASS components for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the Thermal Aging Embrittlement of Cast Austenitic Stainless Steels Program, as required by 10 CFR 54.21(d).

3.0.3.1.23 Environmental Qualification of Electric Component Program

Summary of Technical Information in the Application. LRA Section B3.1 describes the existing Environmental Qualification (EQ) of Electrical Components Program (EQ Program) as consistent with the GALL AMP X.E1, "EQ of Electric Components Program." The applicant states that the EQ program implements the requirements of 10 CFR 50.49 and the guidance provided in Regulatory Guide 1.89, "Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Plants," Revision 1. The EQ Program has been established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety functions in those harsh environments, consistent with 10 CFR 50.49 requirements. The applicant also states that EQ Program manages component thermal, radiation, and cyclical aging with aging evaluations based on 10 CFR 50.49(f) qualification methods. The applicant further stated that, as required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished or replaced, or have their qualification extended by reanalysis, prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered time-limited aging analyses (TLAAs) for license renewal.

Staff Evaluation. During its audit, the staff reviewed the applicant's claims of consistency with the GALL report. In LRA Section B3.1, the applicant claimed that its EQ Program is consistent with GALL AMP X.E1. However, during its audit, the staff found that the applicant's EQ Program did not describe reanalysis attributes. These attributes are important for extending the qualified life of components managed by this program. GALL AMP X.E1 describes reanalysis attributes under the program description. In a letter dated November 5, 2008, the staff issued RAI B3.1-2 to request the applicant to provide a description of reanalysis attributes. In response to the staff's request, in a letter dated December 5, 2008, the applicant stated that a detailed description of the reanalysis attributes of the EQ Program was provided in PINGP LRA Section 4.4.1. For completeness, the applicant stated that this description is also being incorporated into the program description. On LRA page B-83, Section B3.1, Environmental Qualification (EQ) of Electrical Components Program, the applicant added the following information to the end of the existing Program Description:

> Analytical Methods - The PINGP EQ Program uses the same analytical models in the reanalysis of an aging evaluation as those previously applied for the current evaluation. Arrhenius methodology is an acceptable model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For License Renewal acceptable methods for establishing the 60-year normal radiation dose includes multiplying the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years) or using the actual calculated value for 60 years. The result is added to the accident radiation dose to obtain the total integrated dose for the component.
>
> Data Collection and Reduction Methods - Reducing excess conservatism in the component service conditions (for example, temperature, radiation, and cycles) used in the prior aging evaluation is the primary method used for a reanalysis per the EQ Program.
>
> Underlying Assumptions - EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.
>
> Acceptance Criteria and Corrective Action - The reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component is maintained, replaced, or re-

qualified prior to exceeding the period for which the current qualification remains valid.

The staff finds the applicant's response acceptable because it now provides a complete description of reanalysis attributes in the EQ program. These attributes are important for extending the qualified life of components managed by this program. The reanalysis attributes are consistent with those in the GALL AMP X.E1 and the issues raised in RAI B3.1-2 are resolved.

The staff also found that the scope of the EQ Program is not consistent with that in GALL AMP X.E1. The scope of the applicant's EQ Program only included electrical cables and connections subject to 10 CFR 50.49 EQ requirements while the scope of GALL AMP X.E1 includes all electrical components that are important to safety and could be exposed to harsh environment accident conditions. The electrical components important to safety includes safety-related, nonsafety-related whose failure could prevent satisfactory accomplishment of safety functions, and certain post-accident monitoring equipment as identified in Regulatory Guide (RG) 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plant to Assess Plant and Environment Conditions During and Following an Accident." In a letter dated November 5, 2008, the staff issued RAI B3.1-1 to request the applicant to explain how the scope of the applicant's EQ program is consistent with the scope of GALL AMP X.E1 when it only included electrical cables and connections within the scope of the EQ program. In response to the staff request, in a letter dated December 5, 2008, the applicant stated that as described in PINGP LRA Section B3.1, the scope applies to certain electrical components subject to EQ and the guidance provided in Regulatory Guide 1.89, Revision 1. The applicant also stated that this is consistent with the program scope identified in the GALL Report EQ Program. The applicant further stated that PINGP program basis document for the EQ Program does not intend to restrict the program to cables and connections. The applicant further stated that it revised the LRA to clarify the description of the EQ Program as follows:

> In LRA Table 3.6.2-1, "Electrical Components - Electrical Commodity Groups - Summary of Aging Management Evaluation," on Page 3.6-19, the first Component Type row entry for EQ is replaced to read as follows:
>
> > Electrical Components Subject to 10 CFR 50.49 Environmental Qualifications Requirements

The staff finds the applicant response acceptable because the applicant clarified the scope of its EQ program and revised the LRA to include all electrical components subject to 10 CFR 50.49. Electrical components subject to 10 CFR 50.49 includes electrical components important to safety located in a harsh environment. The electrical components important to safety includes safety-related, nonsafety-related whose failure could prevent satisfactory accomplishment of safety functions, and certain post-accident monitoring equipment as identified in RG 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plant to Assess Plant and Environment Conditions During and Following an Accident. The scope of the applicant's EQ program is now consistent with that in the GALL AMP X.E1 and the issues raised in RAI B3.1-1 are resolved.

Operating Experience. The staff also reviewed the relevant OE provided in the LRA and in the plant's basis documents during the audit to confirm that plant-specific OE revealed no degradation not bounded by industry experience. In LRA Section B3.1, the applicant states that a review of OE for the PINGP EQ Program identified no adverse trends or issues with program performance. Minor issues, such as improper splice configurations in the field differing from the tested configuration and normal temperature reference improvements, have been identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. In the basis documents, the applicant stated that PINGP OE shows some past issues. The EQ program and design engineering used informal and non-controlled temperature monitoring data, which affects the integrity of the EQ qualification files. The applicant upgraded EQ files and revised the EQ procedures to improve the program process to maintain basis references. The applicant also stated that the analysis in UFSAR Appendix G, Figure 3.G.1, shows Shield Building Annulus response to low break loss of coolant accident (LBLOCA), that used results in peak containment shell temperature of 222 ºF, with a corresponding peak Shield Building temperature of 161 ºF. More recent analyses resulted in higher peak containment shell temperature of 245 ºF for LBLOCA and 266 ºF for main steam line break, making the analysis in UFSAR Appendix G not conservative and inadequate for EQ purposes. The applicant assessed all components, their respective EQ files, and determined that all components were capable of performing their design functions. The non-conformance was limited to EQ file documentation. The applicant upgraded the EQ files to include the new temperature data. These issues were identified by the PINGP Corrective Action Program for resolution and compliance to all regulatory and EQ Program requirements. The staff confirmed that the applicant's response was appropriate.

The staff finds that the OEs identified above and those identified in program basis documents demonstrated that identification of program weakness and timely corrective actions as part of the EQ program provides assurance that the program will remain effective in assuring that equipment is maintained within its qualification basis and qualified life. 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 A4.3, the applicant provided a UFSAR supplement for EQ of Electrical Components Program. The staff reviewed this section to determine if the information in the UFSAR supplement provides an adequate description of the program as required by 10 CFR 54.21(d). The staff found the applicant's summary of the EQ of Electric Component Program inadequate because it did not include reanalysis attributes that are important for extending the qualified life of components managed by this program. The reanalysis addresses attributes of analytical method, data collection and reduction method, underlying assumptions, acceptance criteria, and corrective actions. In a letter dated November 5, 2008, the staff issued RAI B3.1-3 to request the applicant to provide an adequate summary description of the EQ Program. In response to the staff's request, in a letter dated December 5, 2008, the applicant stated that in LRA Section A3.1, Environmental Qualification of Electrical Components program, on Page A-17, it added the following paragraph to the end of the existing program description, to read as follow:

> "Reanalysis is an acceptable alternative for extending the qualified life of an EQ component. Important attributes of a reanalysis include analytical methods, data

> collection and reduction methods, underlying assumptions, acceptance criteria and corrective actions (if acceptance criteria are not met)."

The staff finds the applicant's response acceptable because the applicant provides an adequate summary of the EQ Program, which is consistent with those in SRP Section 4.4, Table 4.4-2.

The staff determines that the information in the UFSAR supplement as supplemented by the information in the applicant's response to RAI B3.1-3 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 EQ Program and the applicant's response to the staff's RAIs B3.1-1, B3.1-2, and B3.1-3, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.24 Protective Coating Monitoring and Maintenance Program

Summary of Technical Information In the Application. By letter dated March 12, 2009, the applicant added an additional AMP, the Protective Coating Monitoring and Maintenance Program. The applicant does not credit this program for prevention of corrosion carbon steel components. Rather, this program is used to ensure that the amount of failure of coatings that occurs during a LOCA does not exceed the design limits for the strainers. Additional discussion on issues related to the strainers is given in LRA Section 2.1.1.4.3 describes the Generic Safety Issue (GSI) -191, Assessment of Debris Accumulation on Pressurized Water Reactor (PWR) Sump Performance and states:

> GSI-191 addresses the potential for blockage of containment sump strainers that filter debris from water supplied to the emergency core cooling system pumps following a postulated loss-of-coolant accident (LOCA). The NRC has addressed this issue in Regulatory Guide 1.54 (Reference 7), Generic Letter 2004-02 (Reference 8), Generic Letter 98-04 (Reference 9) and other communications. The issue is based on containment sump strainer design and on the identification of new potential sources of debris, including failed containment coatings that have the potential to block the sump strainers. PINGP has replaced the containment sump strainers (containment sump B strainers) in both Units in response to the GSI-191 concerns. The replacement containment sump B strainers are the subject of an AMR as documented in Section 3.2.
>
> PINGP does not credit coatings inside the containment to assure that the intended functions of coated structures and components are maintained. The contribution of coatings to containment debris is event driven and is not related to aging. Therefore, those coatings do not have an intended function. In addition, the issue is not related to the 40-year term of the current operating license; and therefore, is not a TLAA.

The Protective Coating Monitoring and Maintenance Program monitors the performance of Service Level I coated surfaces inside of containment using periodic inspections. This program also provides guidance on the procurement and maintenance of Service Level 1 coatings.

Staff Evaluation. By letter dated March 12, 2009, the applicant submitted the Protective Coating Monitoring and Maintenance Program, which the applicant claimed is consistent with the GALL Report. The staff reviewed the applicant's claim of consistency with the GALL Report.

The applicant provided an element-by-element comparison of the Protective Coating Monitoring and Maintenance Program with GALL AMP XI.S8, "Protective Coating Monitoring and Maintenance Program." The staff reviewed the element-by-element comparison and did not find any exceptions or enhancements or a finding of unacceptability for any of elements. The program consists of a visual inspection of the Service Level 1 coatings looking for any visible defects, such as blistering, cracking, flaking, peeling, delamination, discoloration, or mechanical damage to the coating. The presence of any rust will be noted. The qualification of individuals who coordinate and perform coating condition assessments meet or exceed the ASTM standard for qualifications. The inspection plan and methods for performing the inspection follow the appropriate ASTM standard. The findings are recorded on Inspection Data Sheets and recorded using photographs. A containment coating report is written to document activities performed to verify that the coatings continue to meet the design and licensing basis. Any coating that is damaged is repaired or removed or evaluated to see if it needs to be repaired or replaced. Any damaged coating that is left in service is entered into the Unqualified and Degraded (Qualified) Coatings Log and evaluated against the established acceptance criteria and previous assessment results to ensure the total volume of coatings postulated to fail during a LOCA is less than the design limits.

Based on its review, the staff finds the Protective Coating Monitoring and Maintenance Program consistent with the program elements of GALL AMP XI.S8, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in a letter dated March 12, 2009. The applicant stated that the Protective Coating Monitoring and Maintenance Program is an existing program that incorporates both industry and plant-specific OE to provide added assurance that the condition of coatings inside containment will be managed effectively during the period of extended operation.

Unit 1 was inspected in May 2006, and chipping was observed near the drain at the 695-foot elevation in zone B that covered a four square foot area. Flaking and chipping was observed inside the Regenerative Heat Exchanger Room at elevation 695 feet that covered an area of five square feet.

Unit 2 was inspected in November 2006, and flaking was observed on grating below RCS piping in the 21 RCP/SG vault lower level that covered a six square foot area. Delamination and chipping was also observed on the ladder to lower level 21 RCP/SG vault that covered a small area not considered by the applicant to be significant.

The most recent inspection of Unit 1 coatings took place in February 2008. Cracking was observed over a 0.5 square foot area on the Sump B platform at elevation 695 feet of zone A.

Flaking was also observed on a hanger support at elevation 695 feet of zone B that covered one square foot of area.

The results of these inspections and the discovery of coating degradation were entered into the corrective actions program. The degraded coatings were either removed or evaluated to ensure that the amount of unqualified and degraded qualified coatings were less than the calculated minimum.

The staff confirmed that the OE program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A2.41, the applicant provided the UFSAR supplement for the Protective Coating Monitoring and Maintenance Program.

Based on this review, the staff finds that the UFSAR supplement summary in LRA Section A2.41 provides an acceptable description of the applicant's Protective Coating Monitoring and Maintenance Program because it is consistent with the UFSAR supplement summary description recommended in the SRP-LR for a Protective Coating Monitoring and Maintenance Program

The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Protective Coating Monitoring and Maintenance Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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[1]:

- Bolting Integrity Program
- Closed-Cycle Cooling Water System Program
- Compressed Air Monitoring Program
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Fire Water System Program
- Flux Thimble Tube Inspection Program

- Fuel Oil Chemistry Program
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program
- Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program
- RG 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants Program
- Selective Leaching of Materials Program
- Steam Generator Tube Integrity Program
- Structures Monitoring Program
- Water Chemistry Control Program
- Metal Fatigue of Reactor Coolant Pressure Boundary Program

[1]: In a letter dated March 12, 2009, the applicant amended its Flow-Accelerated Corrosion Program by adding an exception. Thus, this program is changed to one that is consistent with the GALL Report with an exception.

For AMPs that the applicant claimed are consistent with the GALL Report, with exception(s) and/or enhancement(s), the staff performed an audit and review to confirm that those attributes or features of the program, for which the applicant claimed consistency with the GALL Report, were indeed consistent. The staff also reviewed the exception(s) and/or enhancement(s) to the GALL Report to determine whether they were acceptable and adequate. The results of the staff's audits and reviews are documented in the following sections.

3.0.3.2.1 Bolting Integrity

Summary of Technical Information in the Application. LRA Section B2.1.6 describes the existing Bolting Integrity Program as consistent, with enhancement and exception, with GALL AMP XI.M18, "Bolting Integrity." The Bolting Integrity Program includes periodic inspection of closure and structural bolting for indication of cracking, loss of preload, and loss of material due to corrosion. This program manages aging effects for bolting of mechanical components within the scope of license renewal. The applicant stated that PINGP credits the ISI program, IWE Program, IWF Program, Buried Piping and Tanks Inspection Program, External Surfaces Monitoring Program, RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, and Structures Monitoring Program with conducting the inspections of bolting within the scope of the Bolting Integrity Program. Furthermore, the applicant also stated that PINGP takes exception to the use of volumetric examination in high strength bolting.

Instead, the applicant proposes the use of volumetric examination only when prescribed by the plant corrective action 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 enhancement and exception to determine whether the AMP, with the enhancement and exceptions is adequate to manage the aging effects for which the LRA credits it.

In the PINGP LRA, the applicant stated that the PINGP AMP B2.1.6 is an existing program that is consistent with GALL AMP XI.M18, "Bolting Integrity" with exception and an enhancement. The exception affects the "parameters monitored or inspected," and the "detection of aging effects" program elements. The enhancement affects the same program elements

During its audit and 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 the elements in GALL AMP XI.M18, the staff found that the GALL Report "monitoring and trending" program element recommended leak rates to be monitored on a particularly defined schedule was not properly documented in the applicant's bolting integrity program. The staff found that this GALL Report recommendation was not specifically addressed, and should possibly be identified as an exception if it is indeed not met. Therefore, by letter dated November 5, 2008, the staff issued RAI B.2.1.6-1 requesting additional information on the applicant's leak rate monitoring schedule.

By letter dated December 5, 2008, the applicant responded to RAI B.2.1.6-1 by stating that it agrees with the staff's position that the leak rate monitoring issue should be identified as an exception to the GALL Report "monitoring and trending" program element. The applicant submitted this exception crediting its current corrective action program and leak detection process for meeting the recommendations of the GALL Report "monitoring and trending" program element. Furthermore, the applicant states that each new Corrective Action Program Action Request that affects plant equipment is reviewed and assessed by a Senior Reactor Operator. Once a leak is identified, the issue is documented in the corrective action program and frequency of followup inspections is assigned based on the evaluation of the problem. The applicant further stated that, 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 factors such as leak stability, leak reduction, and containment of leakage. Based on the justification provided, the staff found the applicant's response and exception to be acceptable.

Additionally, the applicant stated in PINGP AMP B2.1.6 that its Bolting Integrity Program follows the guidance and standards outlined in NUREG-1339 "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," EPRI NP-5769 "Degradation and Failure of Bolting in Nuclear Power Plants," EPRI TR-104213 "Bolted Joint Maintenance & Application Guide," EPRI TR-111472 "Assembling Bolted Connections Using Spiral-Wound Gaskets," and EPRI NP-5067 Volume 1 and 2 "Good Bolting Practices." However, GALL AMP XI.M18 identifies only NUREG-1339, EPRI NP-5769, and EPRI TR-104213 as guidance relied upon for the Bolting Integrity Program. The applicant did not include an enhancement or exception related to the use of these guidance documents. The use of guidance and standards not endorsed by the GALL program brings into question the adequacy of the standards that were applied, as well as possible differences or contradictions between the GALL endorsed and non-endorsed guidance documents. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.6-2 requesting additional information on the differences and use of these guidance documents.

By letter dated December 5, 2008, the applicant responded to RAI B2.1.6-2 by stating that although the AMP B2.1.6 follows the guidelines and recommendations of EPRI NP-5067 and EPRI TR-111472, in addition to EPRI NP-5769, EPRI TR-104213 and NUREG-1339, the Bolting Integrity Program still meets the intent of the GALL Report recommendations. The applicant referenced a previous NRC determination of the interchangeability of EPRI NP-5067, which was detailed in 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. Additionally, the applicant stated that EPRI TR-111472, “Assembling Bolted Connections Using Spiral-Wound Gaskets” is a training module that is based on EPRI NP-5067 and EPRI TR-104213, and consolidated into a more usable form for plant maintenance and training. The staff noted that the comparison of the reference documents was adequate, and the documents still meet the intent of the GALL Report recommendations. However, the applicant stated that the use of these documents does not represent an exception to the GALL Report. The staff disagrees with this assessment, and discussed the issue with the applicant in a teleconference dated January 22, 2009. The applicant supplemented their response to RAI B2.1.6-2 by letter dated February 6, 2009 by submitting the use of EPRI-5067 and EPRI 111472 as an exception to GALL program elements “scope of program," “preventive actions” and “corrective actions." Based on the justification provided, the staff finds the applicant’s response to be acceptable.

The staff also noted that the applicant plans to use the External Surfaces Monitoring Program, Buried Piping and Tanks Inspection Program, Structures Monitoring Program, and RG 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants Program as other AMPs that implement aspects of the bolting integrity program. However, the staff found that these supplemental programs include inconsistent statements in their program basis documents regarding their management of bolting. The discrepancies indicate a possible misunderstanding of the intent of the Bolting Integrity Program. As a result, it is not clear how, or if, these supplemental programs implement the specifications set in the Bolting Integrity Program. Therefore, by letter dated November 5, 2008, the staff issued RAI B.2.1.6-4 to request additional information on the inspection requirements included in the supplemental AMPs, which will meet the recommendations of the Bolting Integrity Program.

By letter dated December 5, 2008, the applicant responded to RAI B.2.1.6-4 by stating that they concur with the staff’s position that the requirements for bolting inspection originate in the Bolting Integrity Program. The applicant clarified that the AMPs supplementing the Bolting Integrity Program will include the specific inspection requirements, which are outlined in the Bolting Integrity Program to ensure consistent implementation. Furthermore, the applicant clarified that the statements made in their LRA are not meant to suggest that the AMPs supplementing the Bolting Integrity Program supersede or contradict the Bolting Integrity Program. Additionally, the applicant responded to a specific example identified by the staff, wherein it was not clear whether a program identified as supplementing the Bolting Integrity

Program included bolting in its aging management by updating the External Surfaces Monitoring Program to include a specific reference to bolting as a component that is managed. Based on the clarification provided, the staff finds the applicant's response to be acceptable.

Exception. LRA Section B2.1.6 states an exception to the following GALL Report program elements: parameters monitored or inspected, and detection of aging effects. Specifically, the exception stated the following:

> High strength bolting used in steam generator hold-down supports, reactor coolant pump supports, and other structural applications is periodically examined with visual techniques. Performing visual inspections of high strength bolts in lieu of a volumetric examination is an exception to the discussion provided in GALL AMP XI.M18. For stress corrosion cracking to occur in a susceptible high strength bolting material, a sustained high tensile stress and a corrosive environment must be present. Visual examinations of structural assemblies will detect corrosion or conditions indicative of a corrosive environment that could lead to stress corrosion cracking in potentially susceptible high strength bolting, and will cause appropriate corrective action to be taken under the Corrective Action Program when necessary. Corrective action may include volumetric examination of affected bolts, hammer testing, or other actions appropriate for the condition. Therefore, visual examination, as described, will effectively manage the aging of installed high strength bolting.

The staff agrees with the applicant's assertion that a sustained high tensile stress and a corrosive environment must be present in order to initiate SCC, and is discussed in EPRI NP-5067. The staff notes that this is identified in the GALL Report "detection of aging effects" program element, and allows the recommendation to be waived with sufficient plant-specific justification. The applicant states that the plant's Corrective Action Program will trigger proper corrective actions based on the results of visual examinations for conditions indicative of a corrosive environment. The applicant also states that if a corrosive environment is found through visual examinations, followup testing includes volumetric examination, hammer testing, or other actions appropriate for the condition. The staff finds that the proposed exception meets the intent of the GALL Report recommendations with a plant-specific corrective action program, which will identify proper followup actions if a conforming condition is identified. On the basis of its review as described above, the staff finds that this exception is acceptable.

Enhancement. LRA Section B2.1.6 states an enhancement to the GALL Report program elements: parameters monitored or inspected, and detection of aging effects. Specifically, the enhancement stated the following:

> Procedures for the conduct of inspections in the External Surfaces Monitoring Program, Structures Monitoring Program, Buried Piping and Tanks Inspection Program, and the RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program will be enhanced to include guidance for visual inspections of installed bolting.

The staff noted that the enhancement would affect multiple different AMPs, did not include details on what guidance would be enhanced, and specifically what would be included in those enhancements. The staff noted that the lack of detail in this enhancement brings into question whether the changes will address the specifications recommended by the Bolting Integrity Program. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.6-3 requesting additional information on the details of the enhancement described.

The applicant responded to RAI B2.1.6-3 by letter dated December 5, 2008, stating that the AMPs listed in the enhancement will be enhanced to include guidance through the implementation of procedural guidelines, which meet the intent of the GALL Report recommendations. The applicant further clarified the guidelines to be added by stating that procedural guidance will be included to monitor the effects of aging on the intended function of closure and structural bolting, and will specifically define the conditions indicative of potential degradation such as evidence of leakage, loosening, corrosion, or conditions that could lead to SCC. Based on the clarification provided, the staff finds that the applicant's response to this RAI to be acceptable since the enhancements described will meet the GALL Report recommendations when implemented.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.6. The applicant stated that "the Bolting Integrity Program incorporates both plant and industry experience on bolting issues." To verify the accuracy of this statement, the staff reviewed a sample of CRs, and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. A CR indicated that in 2005, improper thread engagement was discovered on the containment spray pump. The staff found that proper corrective actions were taken to address the issue as well as proper followup inspections on the pump. This report and others like it 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.2.6, 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).

In Commitment No. 4, the applicant committed to implement the enhancement described above to this existing program before entering the period of extended operation.

Conclusion. The staff has reviewed the information provided in Section B2.1.6 of the LRA Appendix B and additional information provided by the applicant by letters dated December 5, 2008, and February 6, 2009. 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 exception and the associated justification, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. In addition, the staff has reviewed the enhancement and confirmed that the implementation of the enhancement prior to the PEO would result in the existing AMP being consistent with the GALL AMP XI.M18. 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 concluded that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Closed-Cycle Cooling Water System

Summary of Technical Information in the Application. LRA Section B2.1.9 describes the existing Closed-Cycle Cooling Water System Program as consistent, with exceptions and enhancement, with GALL AMP XI.M21, "Closed-Cycle Cooling Water System." The applicant stated that the Closed-Cycle Cooling Water System Program is both a preventive and condition monitoring program that is based on EPRI "Closed-Cycle Cooling Water Chemistry Guideline," TR-107396, Revision 1. The program includes preventive measures to minimize corrosion, heat transfer degradation, and Stress Corrosion Cracking (SCC); and testing and inspection to monitor the effects of corrosion, heat transfer degradation, and SCC on the intended functions of the components. The applicant stated that preventive measures consist of maintaining the system corrosion inhibitor concentrations within specified limits by periodic testing; that testing is performed to verify key chemistry parameters and to measure impurities, conductivity and microbiological growth; that inspections are performed to identify corrosion, fouling and SCC that may be present; and that cleaning and inspection of heat exchangers are performed periodically along with pump and heat exchanger performance and functional testing.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and 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 staff reviewed the applicant's program basis document, on-site procedures, corrective actions reports, and other plant documents that were included in the applicant's license renewal program basis document binder for the Closed-Cycle Cooling Water System Program and that contained information supporting the applicant's evaluation of this AMP.

The staff noted that the Closed-Cycle Cooling Water System Program is credited with managing the aging effects of loss of material corrosion due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion (MIC). The staff noted that the AMP relies on use of appropriate materials, corrosion inhibitors, and closed-cycle cooling water chemistry to protect the internal metal surfaces of components exposed to closed-cycle cooling water. The staff noted that performance adequacy of systems and components in continuous operation is verified by monitoring and trending of system and component operating parameters and by periodic testing of those components not normally in operation are tested periodically. The staff noted that acceptance criteria and tolerances are based on system and component design parameters and functions, and that corrosion inhibitor concentrations are maintained within limits by periodic testing at specified frequencies. The staff finds these features of the applicant's Closed-Cycle Cooling Water System program consistent with recommendations in the GALL Report.

The staff compared program elements in the applicant's program to those in GALL AMP XI.M21 and found that the program elements in the AMP that the applicant claims to be consistent with the GALL Report are consistent with the corresponding program element criteria recommended in GALL AMP XI.M21. Except for the enhancement and exceptions described in the LRA by the applicant, the staff did not identify any differences between recommendations in the GALL Report and the applicant's consistency claims.

Exception 1. LRA Section B2.1.9 states an exception to the "preventive actions" program element. The exception is that guidance provided in EPRI TR-107396, Revision 1 (1007820), "Closed Cooling Water Chemistry Guideline," April 2004, is used in lieu of recommendations in EPRI TR-107396, Revision 0, "Closed Cooling Water Chemistry Guideline," October 1997, which is the version of the EPRI guidelines recommended in the GALL Report.

Because the GALL Report refers to EPRI TR-107396, Revision 0, and does not include a statement about use of later revisions of this guidance document, the applicant identified use of EPRI TR-107396, Revision 1, as an exception to the GALL Report. During its audit, the staff noted in the license renewal AMP basis document for the Closed-Cycle Cooling Water System Program the applicant's statement that Revision 1 is the most recent revision of the EPRI guidance document and that it provides more prescriptive guidance than Revision 0 based on the latest industry operating experience (OE).

The staff noted that although GALL AMP XI.M21 lists EPRI TR-107396, Revision 0, among its references, the GALL Report does not limit an applicant to using only that version of the EPRI Closed Cooling Water Chemistry Guidelines as a basis for its AMP. Because the GALL Report does not restrict use of more recent version of the EPRI guidelines, the staff finds the applicant's use of EPRI TR-107396, Revision 1, in lieu of Revision 0, to be acceptable. On this basis, the staff finds Exception 1 to the "preventive action" program element to be acceptable.

Exception 2. LRA Section B2.1.9 states an exception to the "parameters monitored/inspected" program element. The exception is that some of the pump and heat exchanger performance parameters recommended by the GALL Report are not used for monitoring specific pumps or smaller converters serviced by the closed-cycle cooling water systems.

In a letter dated November 5, 2008, the staff issued RAI AMP-B2.1.9-1 asking the applicant to provide a more detailed description of this exception, stating what pumps and heat exchangers (converters) are affected by this exception and what performance parameters are monitored.

The applicant responded to RAI AMP-B2.1.9-1 in a letter dated December 5, 2008. In that letter, the applicant provided a detailed list of closed cooling water subsystems and equipment affected by the exception. These include chiller loops and hot water converter loops for various buildings and rooms and the diesel generator jacket water cooler loops. For these subsystem loops, where the installed instrumentation does not include measurements recommended in the GALL Report, the applicant credited measurement of alternative performance parameters where alternative installed instrumentation is available, or credited additional chemistry parameter measurements and total metal analysis (iron and copper) using in-house testing or outside laboratory testing on quarterly or yearly frequency. The applicant also stated that performance monitoring of the diesel generator water jacket cooler loops is consistent with commitments made in response to NRC Generic Letter 89-13, “Service Water System Problems Affecting Safety Related Components.”

In a letter dated February 6, 2009, the applicant modified its original response. The applicant noted that their original response had stated that no performance parameters are monitored for three of the closed-cooling water loops: 1) the cold lab chiller loop, 2) the computer room chiller loop, and 3) the hot lab chiller loop. The applicant stated that since these loops are not subject to any periodic performance testing, it had determined that this should also be identified as an exception to the “detection of aging effects” program element. The applicant revised LRA Section B2.1.9, to state an exception, to the “detection of aging effects” program element. This exception reads as follows:

> “No periodic performance testing is conducted on the cold lab chiller loop, computer room chiller loop, or hot lab chiller loop as recommended by NUREG-1801. Periodic sampling and chemistry controls are adequate to manage these closed-cycle cooling water systems.”

The staff noted that the applicant uses installed performance monitoring instrumentation and periodic chemical testing as part of its normal process for monitoring of the closed-cycle cooling water system. The staff also noted that where existing instrumentation is available to monitor parameters recommended in the GALL Report, the applicant appropriately credits the use of the available instrumentation. For each of the closed-cycle cooling water loops where the applicant stated that installed instrumentation is available, but the available instrumentation does not measure the specific performance parameters recommended in the GALL Report, the applicant also credited periodic monitoring of closed-cycle cooling water chemistry parameters and total metallic species (iron and copper) to provide indications of system or component aging. The staff finds monitoring of alternative performance parameters, along with total metallic species, to be acceptable because the alternative monitoring also provides indications of aging effects in components and systems exposed to closed-cycle cooling water and is consistent with the SRP-LR, Section A.1.2.3.3 recommendation that the parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function.

For the cold lab chiller loop, the computer room chiller loop, and the hot lab chiller loop where the applicant stated that no performance parameters are monitored, the staff noted that the applicant credited only annual sampling of chemistry parameters and total metals (iron and copper) with detecting the effects of aging. In a telephone call with the applicant dated February 10, 2009, the staff stated that annual sampling of chemistry parameters and total metals is not sufficient to determine whether aging is occurring and asked the applicant to further justify the proposed AMPs for the cold lab chiller loop, the computer room chiller loop, and the hot lab chiller loop.

In a letter dated February 26, 2009, the applicant clarified that visual inspections will be performed for the cold lab chiller loop, the computer room chiller loop, and the hot lab chiller loop. In addition, the applicant revised the exception to the “detection of aging effects” program element to read as follows:

> No periodic performance testing is conducted on the cold lab chiller loop, computer room chiller loop, or hot lab chiller loop as recommended by NUREG-1801. Periodic visual inspections will be performed on these systems to identify the presence of aging effects and to confirm the effectiveness of chemistry controls. The coolant environment in these chiller loops is managed by periodic sampling and chemistry control. Chemical controls and visual inspections are adequate to manage aging effects in these closed-cycle cooling water systems.

The staff noted that in its revised response, the applicant states that periodic visual inspections will be performed in lieu of performance monitoring for the cold lab chiller loop, computer room chiller loop, and hot lab chiller loop, which do not have installed instrumentation to provide performance monitoring. The staff finds use of periodic visual inspections acceptable because visual inspections are able to detect whether loss of material due to corrosion is occurring and whether chemistry control of the closed-cycle cooling water is adequate to prevent or eliminate this aging effect.

Based on its review of the applicant's response to RAI AMP-B2.1.9-1, and the applicant's additional clarifications of that response, the staff determined that the applicant's use of available performance monitoring instrumentation and additional periodic chemical sampling, plus periodic inspections where performance monitoring instrumentation is not installed, is adequate to provide indications of equipment and component degradation that might be caused by aging effects the applicant performs supplement performance monitoring for those close-cycle cooling water systems on which instrumentation has been installed and because the applicant performs sampling and testing of total metal ions in these systems. On this basis, the staff finds the issues in RAI AMP-B2.1.9-1 to be resolved and Exception 2 to the "parameters monitored/inspected" program element to be acceptable.

Enhancement 1. LRA Section B2.1.9 states an enhancement to the "monitoring and trending" program element. The applicant stated that the program will be enhanced to include an internal visual examination of accessible surfaces of components serviced by closed-cycle cooling water when the systems or components are opened during scheduled maintenance or surveillance activities.

During review of AMR results, the staff noted that the applicant credited the Closed-Cycle Cooling Water System Program with managing the aging effect of cracking in steel components exposed to closed cooling water (CCW). In a letter dated December 18, 2008, the staff issued RAI 3.3.2-13-01, which is discussed further in SER Section 3.3.2.3.13, asking the applicant to clarify how cracking in steel components would be detected by the Closed-Cycle Cooling Water System Program. In a response dated January 20, 2009, the applicant stated that inspections for cracking will be performed by visual examination with a magnified resolution (i.e. enhanced visual) as described in 10 CFR 50.55a(b)(2)(xxi)(A) or with ultrasonic methods. The applicant also revised Enhancement 1 to read as follows:

> The program will be enhanced to include periodic inspection of accessible surfaces of components serviced by closed-cycle cooling water when the system or components are opened during scheduled maintenance or surveillance activities. Inspections are performed to identify the presence of aging effects and to confirm the effectiveness of the chemistry controls. Visual inspection of

> component internals will be used to detect loss of material and heat transfer degradation. Enhanced visual or volumetric examination techniques will be used to detect cracking.

In its letter dated April 13. 2009, the applicant revised its License Renewal Commitment List, Commitment No. 6, to include this revised enhancement as described above, with implementation to occur prior to the period of extended operation.

The GALL Report references EPRI TR-107396 as a basis for the Closed-Cycle Cooling Water System Program. EPRI-TR-107396, Revision1, Section 8.2, states that one of the most effective methods of determining the extent of fouling in closed cooling water components is through visual inspection of opened system components and that this can be done any time a system component is taken out of service for scheduled maintenance. The staff noted that the applicant’s proposed enhancement adds a procedural provision in maintenance and surveillance instructions to perform opportunistic visual examination of accessible surfaces whenever systems or components serviced by the closed-cooling water system are opened during scheduled maintenance or surveillance activities.

In its review of on-site documentation for the applicant’s Closed-Cycle Cooling Water System Program, the staff noted that the applicant performs periodic visual inspections using corrosion coupons, which is consistent with the recommendations in EPRI-TR-107396, Revision 1, Section 8.8.1. The staff further noted that the opportunistic visual examinations are performed in addition to the inspection of corrosion coupons and finds that the additional visual examinations provide increased assurance that aging effects will be detected before they can cause loss of component or system intended functions. In its letter of January 20, 2009, the applicant stated that enhanced visual or volumetric examination techniques will be used to inspect for cracking.

The staff noted that the new procedural provision provides increased visual examinations consistent with the EPRI guidelines referenced in GALL AMP XI.M21. These examinations increase confidence that indications of fouling or loss of material due to corrosion are discovered so that corrective actions can be taken before a component's intended functions are adversely affected. Furthermore, enhanced visual or ultrasonic techniques provide inspection methodologies that are capable of detecting the aging effect of cracking, which also is managed by this AMP. Because the enhancement provides procedural changes that are consistent with recommendations in the GALL Report and is included in Commitment No. 6 of the applicant’s License Renewal Commitment list, the staff finds the proposed enhancement to the applicant’s Closed-Cycle Cooling Water System Program to be acceptable.

Operating Experience. The staff reviewed the OE described in LRA Section B2.1.9. The applicant stated that a review of OE for the Closed-Cycle Cooling Water System Program identified no adverse trends or issues with program performance. The applicant stated that conditions such as corrosion, fouling, and out-of-range chemistry parameters have been identified and corrected prior to causing significant impact to safe operation or loss of intended functions and that adequate corrective actions were taken to prevent recurrence.

The staff reviewed the OE discussion that was provided in the applicant’s license renewal program basis document binder for the Closed-Cycle Cooling Water System Program. The staff confirmed that the applicant’s review of OE included evaluation of both industry and plant-specific events that have occurred since issuance of the GALL Report, Revision 1. The staff reviewed additional selected CRs related to the applicant's Closed-Cycle Cooling Water System Program and interviewed the applicant's subject matter experts for the Closed-Cycle Cooling Water System Program. CRs reviewed by the staff included ones where the applicant found indications of corrosion, out-of-specification-chemistry conditions, and leaking components in the closed-cycle cooling water system. For all CRs reviewed, the staff noted that the applicant had performed adequate evaluations to determine a cause for the event and had taken corrective action adequate to repair or replace components or to restore operation within specification. Based on its review of the plant-specific OE, the staff finds that the applicant's program has demonstrated its capability to monitor, trend and control closed-cycle cooling water chemistry parameters consistent with recommendations of the EPRI guidelines referenced in the GALL Report, and to implement corrective actions adequate to prevent loss of intended functions for components and systems affected by the Closed-Cycle Cooling Water System Program.

Based on this review, the staff finds (1) that the OE for this AMP demonstrates that the applicant's Closed-Cycle Cooling Water System Program is achieving its objective of mitigating aging effects of cracking, loss of material, or reduction of heat transfer due to fouling for materials exposed to treated water in the closed-cycle cooling water system, and (2) that the applicant is taking appropriate corrective actions through implementation of this program.

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 A2.9, the applicant provided the UFSAR supplement for the Closed-Cycle Cooling Water System Program. The staff verified that the UFSAR supplement summary for the Closed-Cycle Cooling Water System Program conforms to the staff's recommended UFSAR supplement for this type of program as described in the SRP-LR.

In its letter dated April 13, 2009, the applicant provided a list of license renewal commitments. The staff verified that the applicant has included the program enhancements identified in the LRA for the Closed-Cycle Cooling Water System Program in Commitment No. 6 of the final License Renewal Commitment List. The staff also verified that the applicant's Commitment No. 6 includes a statement that periodic visual inspections of the cold lab chiller loop, computer room chiller loop, or hot lab chiller loop will be performed to identify the presence of aging effects and to confirm the effectiveness of chemistry controls.

The staff finds that the UFSAR supplement summary in LRA Section A2.9 provides an acceptable description of the applicant's Closed-Cycle Cooling Water System Program because it is consistent with the UFSAR supplement summary description recommended in the SRP-LR for a Closed-Cycle Cooling Water System program. The applicant has appropriately included all program enhancements in Commitment No. 6 of the License Renewal Commitment list, which is linked with UFSAR supplement Section A.2.9 and scheduled for implementation prior to the period of extended operation.

The staff determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's Closed-Cycle Cooling Water System Program and the applicant's response to RAI AMP-B2.1.9-1, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. The staff also reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. In addition, the staff reviewed the enhancement, as modified by the applicant's response to RAI 3.3.2-13-01 and confirmed that its implementation through Commitment No. 6 prior to the period of extended operation makes the existing AMP consistent with the GALL AMP to which it was compared, with acceptable exceptions. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 Compressed Air Monitoring

Summary of Technical Information in the Application. LRA Section B2.1.10 describes the Compressed Air Monitoring Program as an existing program that is consistent with GALL AMP XI.M24, "Compressed Air Monitoring," with enhancements and an exception. The applicant stated that this program conducts periodic air quality sampling, inspections, component functional testing, and leakage testing. Additionally, the applicant further stated that preventive maintenance is performed at regular intervals to assure system components continue to operate reliably, thereby assuring that quality air is supplied to plant equipment.

Staff Evaluation. During its audit the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception and the enhancements to determine whether the applicant's AMP, with the exception and the enhancements, is adequate to manage the aging effects for which the LRA credits it. In comparing the program elements in the applicant's program to those in GALL AMP XI.M24, Compressed Air Monitoring, the staff confirmed that the program elements in the applicant's AMP are consistent with the GALL Report's AMP XI.M24 corresponding program element criteria, except for the exception and enhancements.

Exception. The applicant has taken an exception to the "preventive actions" and "detection of aging effects" program elements as follows:

> The PINGP Compressed Air Monitoring Program does not explicitly incorporate the performance testing guidelines provided in EPRI NP-7079, EPRI TR-108147, and ASME OM-S/G-1998, Part 17, that are listed in NUREG-1801. The PINGP Station and Instrument Air System is an older installation, which was not designed and installed with the instrumentation and features (i.e., in-line dewpoint indication with alarm) necessary to conduct the specified performance testing. Instead, preventive maintenance activities are conducted on Station and Instrument Air System components, based upon manufacturer's recommendations and other EPRI guidance. These routine maintenance activities in conjunction with system inspections and system alarms provide for sufficient inspection and monitoring to ensure the timely detection of aging effects such that the Station and Instrument Air System is capable of performing its intended function.

The staff reviewed ASME OM-S/G-1998, Part 17, "Performance Testing of Instrument Air Systems Information Notice Light-Water Reactor Power Plants," and ISA-S7.0.1-1996, "Quality Standard for Instrument Air," which are referenced in GALL AMP XI.M24. The staff noted that PINGP is an older plant and does not have the necessary design features for an in-line dewpoint indication with alarm. The staff noted that ISA-S7.0.1-1996, in Section 5.1 states that a monitored alarm for pressure dew-point is preferred; however, if a monitored alarm is unavailable, per shift monitoring is recommended. The staff reviewed the applicant's program basis document and implementing procedures and noted that the PINGP Station and Instrument Air System receivers, dryers, and moisture separators are checked for moisture several times daily during plant rounds. The staff also noted that the preventive maintenance program for the air compressors, dryers, and filters is based upon manufacturer's recommendations. Based on ISA-S7.0.01, the staff noted that pressure dewpoints are established to protect instrument air systems from the presence of moisture. By performing frequent moisture checks, the applicant is ensuring that moisture is not present in the compressed air system; thereby ensuring that the program is consistent with the "preventive actions" program element of GALL AMP XI.M24. Based on this review, the staff finds this exception acceptable because the applicant performs moisture checks several times daily and performs periodic inspections as recommended by the manufacturer to ensure that the station and instrument air system is capable of performing its intended function.

Enhancement 1. In LRA Section B2.1.10, the applicant included an enhancement to the "preventive actions" and "acceptance criteria" program elements to state that station and instrument air system air quality will be monitored and maintained in accordance with the instrument air quality guidance provided in ISA S7.0.01-1996; and particulate testing will be revised to use a particle size methodology as specified in ISA S7.0.01.

The staff reviewed the applicant's program basis document and noted that the applicant is using ISA S7.3 acceptance criteria. The acceptance criteria of ISA S7.3 states that in no case shall the dewpoint exceed 35^{o} F, and the maximum particle size in the air stream shall not exceed 3 micrometers. The acceptance criteria of ISA S7.0.01 states that in no case shall dewpoint exceed 39 ^{o}F, and a maximum 40-micrometer particle size in the instrument air system is acceptable. The staff finds that this enhancement to use the guidance of ISA S7.0.01 will make the Compressed Air Monitoring Program consistent with GALL AMP XI.M24, "preventive actions" program element, which recommends guidelines based on ISA-S7.0.01-1996. The staff also verified that the applicant has included Commitment No. 7 in its commitment list to enhance the program to include S7.0.01 criteria prior to the period of extended operation. On the basis that the enhancement, when implemented, will make the Compressed Air Monitoring Program consistent with the GALL Report, the staff finds the enhancement acceptable.

Enhancement 2. In its letter dated February 6, 2009, in response to the NRC Region III inspection, the applicant included an enhancement to "preventive actions" and "detection of aging effects" program elements to state that the program will be enhanced to include on-line dewpoint monitoring (Commitment No. 7).

The applicant stated that the PINGP station and instrument air dryers are equipped with color-change moisture indicators, which provide a constant visual indication that dry gas is being supplied to the dryer outlet. However, the PINGP Compressed Air Monitoring Program did not credit the use of the moisture indicators as a means of on-line dewpoint monitoring. As a result, the applicant determined that on-line dewpoint monitoring should be explicitly addressed as an enhancement to the existing program.

The staff finds that this enhancement to include on-line dewpoint monitoring will make the Compressed Air Monitoring Program consistent with GALL AMP XI.M24, “preventive actions” program element, which recommends the system air quality is monitored and maintained to ensure that the system and components meet specified operability requirements. The staff also verified that the applicant has revised Commitment No. 7 in its commitment list to enhance the program to include on-line dewpoint monitoring prior to the period of extended operation. On the basis that the enhancement, when implemented, will make the Compressed Air Monitoring Program consistent with the GALL Report, the staff finds the enhancement acceptable.

Based on its review of the exception and the enhancements, the staff finds the applicant’s Compressed Air Monitoring program acceptable because it conforms to the recommended GALL AMP XI.M24, Compressed Air Monitoring, with enhancements.

Operating Experience. The staff reviewed the OE provided in LRA Section B2.1.10 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 reviewed CRs as part of the OE review during the audit and found that the applicant had identified that station air compressor jacket cooling outlet temperature was higher than normal. The staff noted that the applicant determined that the control valve orientation was not proper, and took corrective action to properly orient the valve and made changes to the piping configuration to address the issue. In another CR, the staff noted that the applicant had identified that an air dryer inlet control valve was stuck. The applicant determined that these control valves had aged significantly and took corrective action to replace these valves. The staff noted that as part of its generic issue resolution, the applicant determined that the air dryers were also very old, and took the corrective action to replace the dryers.

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 Compressed Air Monitoring Program, with the corrective actions discussed in the LRA, has been effective in identifying, monitoring, and correcting the effects of age-related degradation in station and instrument air system.

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 A2.10, the applicant provided the UFSAR supplement for the Compressed Air Monitoring Program. The staff verified that the UFSAR supplement summary description for the Compressed Air Monitoring Program was in conformance with the staff’s recommended UFSAR supplement for the Compressed Air Monitoring Program provided in Table 3.3-2 of the SRP-LR.

In its letter dated April 13, 2009, the applicant provided a list of License Renewal Commitments. The staff verified that the applicant included Commitment No. 7 in the final license renewal commitment list, the program enhancements identified in the LRA and its letter dated April 13, 2009 for the applicant's Compressed Air Monitoring Program.

Based on this review, the staff finds that UFSAR supplement Section A2.10 provides an acceptable UFSAR supplement summary description of the applicant's Compressed Air Monitoring Program because it is consistent with those UFSAR supplement summary description in the SRP-LR for the Compressed Air Monitoring Program. The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Compressed Air Monitoring Program and the applicant's response to NRC Region III inspection, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff also reviewed the enhancements and confirmed that their implementation through Commitment No. 7 prior to the period of extended operation will make the existing AMP consistent with the GALL AMP to which it was compared. 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 function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Technical Information in the Application. LRA Section B2.1.11 describes the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program as a new program that will be consistent, with exceptions, to GALL AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The applicant states that the program conducts a one-time test of a representative sample of electrical cable connections (metallic portions) to confirm the absence of aging effects (loose connections). Cable connections terminating within an active or passive device/enclosure from external sources are within the scope of this program. However, the applicant states that cable/wiring connections terminating within an active or passive device/enclosure from internal sources are not within the scope of this program. The applicant also states that the program manages the aging effects of loose connections and electrical failure from the following aging stressors: thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion and oxidation. The representative sample includes connections of various voltage applications (medium and low voltage), circuit loadings, and locations (high temperature, high humidity, vibration, etc.). The technical basis for the sample selections will be documented. The applicant further stated that the exceptions are consistent with the proposed Interim Staff Guidance LR-ISG-2007-02, noticed for public comment in the Federal Register on September 6, 2007 (72 FR 51256).

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with exceptions, is adequate to manage the aging effects for which the LRA credits it.

Based on its review, the staff finds that the applicant's metal enclosed bus (MEB) Program consistent with the program elements of GALL AMP XI.E4.

The staff's review of exceptions is discussed below.

Exception 1. LRA Section B2.1.11 states an exception to the Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects, and Monitoring and Trending program elements. The applicant stated that the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is consistent with the GALL Report as it is modified by the proposed LR-ISG-2007-02. The applicant also stated that the GALL Report describes an AMP for electrical cable connections in revision to this program is being developed via the Interim Staff Guidance (ISG) process. The applicant further stated that a revised program was published for public comment on September 6, 2007, in Federal Register Notice 72 FR 51256 "Proposed License Renewal Interim Staff Guidance LR-ISG-2007-02: Changes to Generic Aging Lessons Learned (GALL) Report Aging Management Program (AMP) XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" Solicitation of Public Comment."

The staff issued draft LR-ISG-2007-02 on September 6, 2007, for public comments. In this ISG, the staff clarifies and recommends a one-time inspection to ensure that either aging of metallic cable connections is not occurring or an existing maintenance program is effective. Upon receiving public comments, the staff will evaluate comments and make a determination to incorporate comments, as appropriate. Once the NRC staff completes the LR-ISG, it will issue the LR-ISG for industry use. The staff will incorporate the approved LR-ISG into the next revision of the license renewal guidance document. Until then, the staff will compare the elements of applicant's Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program against those currently in the GALL AMP XI.E6. Any deviation from the GALL AMP XI.E6 will require the applicant's description for each exception and element affected. The staff noted that the applicant did not specifically identify each exception and program element associated with the exceptions. In RAI B2.1.11-1, the staff requested the applicant to provide description of the exceptions to GALL XI.E6 and the program elements associated with these exceptions.

In a letter dated February 6, 2008, the applicant responded that the differences resulted in the PINGP Electrical Cable Connections Not Subject to 50.49 Environmental Qualification Requirements Program having exceptions to four elements of the GALL Report program. The specific exceptions are summarized below.

Program Element 1, Scope of Program. GALL Report, XI.E6 Element 1, states:

"Connections associated with cables in scope of license renewal are part of this program, regardless of their association with active or passive components."

The PINGP program states:

> …Program is a one-time inspection program that tests a representative sample of cable connections based upon factors such as application (medium and low voltage), connection type, circuit loading, and location (high temperature, high humidity, vibration, etc.). Cable connections terminating within an active or passive device/assembly from external sources are within the scope of this program. Cable/wiring connections terminating within an active assembly from internal sources are not within the scope of this program.

The exceptions to GALL AMP XI.E6 Element 1, are a result of:

(1) The proposed LR-ISG-2007-02 provides for a one-time inspection/test program, while the GALL AMP XI.E6 program specifies periodic testing.

(2) The proposed LR-ISG-2007-02 excludes high-voltage applications (states only medium and low voltage applications), while the GALL AMP XI.E6 program includes high, medium, and low voltage applications.

(3) The proposed LR-ISG-2007-02 excludes internal wiring/cable connections within active assemblies, while the GALL AMP XI.E6 program does not differentiate between internal wiring connections within an active assembly and external cable connections to active or passive assemblies.

<u>Program Element 3, Parameters Monitored/Inspected</u>. GALL AMP XI.E6 Element 3, states the following:

> This program will focus on the metallic parts of the connection. The monitoring includes loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. A representative sample of electrical cable connections is tested. The following factors are to be considered for sampling: application (high, medium and low voltage), circuit loading, and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected is to be documented.

The PINGP Program states the following:

> ... Program will focus on the metallic parts of cable connections. The one-time inspection will test a representative sample of electrical connections having different voltage applications (medium and low voltage) and locations (high temperature, high humidity, vibration, etc.), and will demonstrate that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation does not occur, and would not require a periodic AMP to prevent electrical connection failures during the period of extended operation. Cable connections terminating within an active or passive device/assembly from external sources are within the scope of this program. Cable/wiring connections terminating within an active assembly from internal sources are not within the scope of this program. The technical basis for the sample selected will be documented.

The exceptions to GALL AMP XI.E6 Element 3, are a result of the following:

- The proposed LR-ISG-2007-02 excludes high-voltage applications (states only medium and low voltage applications), while the NUREG-1801, XI.E6 program includes high, medium, and low voltage applications.
- The proposed LR-ISG-2007-02 excludes internal wiring/cable connections within active assemblies, while the NUREG-1801, XI.E6 program does not differentiate between internal wiring connections within an active assembly and external cable connections to active or passive assemblies.

Program Element 4, Detection of Aging Effects. NUREG-1801, XI.E6 Element 4, states:

> Electrical connections within the scope of license renewal will be tested at least once every 10 years. Testing may include thermography, contact resistance testing, or other appropriate testing methods. This is an adequate period to preclude failures of the electrical connections since experience has shown that aging degradation is a slow process. A 10-year testing interval will provide two data points during a 20-year period, which can be used to characterize the degradation rate. The first tests for license renewal are to be completed before the period of extended operation.

The PINGP Program states the following:

> ... Program is a one-time inspection program that tests a representative sample of electrical connections within the scope of license renewal and subject to AMR. Cable connections terminating within an active or passive device/assembly from external sources are within the scope of this program. Cable/wiring connections terminating within an active assembly from internal sources are not within the scope of this program.
>
> Factors considered for sample selection will be application (medium and low voltage) ...

The exceptions to NUREG-1801, XI.E6 Element 4, are a result of the following:

- The proposed LR-ISG-2007-02 provides for a one-time inspection/test program, while the NUREG-1801, XI.E6 program specifies periodic testing.
- The proposed LR-ISG-2007-02 excludes high-voltage applications (states only medium and low voltage applications), while the NUREG-1801, XI.E6 program includes high, medium, and low voltage applications.
- The proposed LR-ISG-2007-02 excludes internal wiring/cable connections within active assemblies, while the NUREG-1801, XI.E6 program does not differentiate between internal wiring connections within an active assembly and external cable connections to active or passive assemblies.

Program Element 5, Monitoring and Trending. NUREG-1801, XI.E6 Element 5, states the following:

> "Trending actions are not included as part of this program because the ability to trend test results is dependent on the specific type of test chosen. However, test results that are trend able provide additional information on the rate of degradation."

The PINGP Program states the following:

> "The Electrical Cable Connections Not Subject to 10CFR50.49 Environmental Qualification Requirements Program is a one-time inspection program, and trending actions are not included."

The exception to NUREG-1801, XI.E6 Element 5, is related to the frequency of testing. The GALL Report recommends periodic testing. However, proposed LR-ISG-2007-02 provides for a one-time inspection/test program.

During the review of the staff's followup question, the applicant determined that LRA Sections A2.1 and B2.1.11 should be changed to use terms that conform to the terminology used in the proposed LR-ISG-2007-02. Accordingly, the applicant made changes to in LRA Section A2.11 on Page A-6, the second and third sentences are revised to read as follows:

> Cable connections terminating within an active or passive device/assembly from external sources are within the scope of this program. Cable/wiring connections terminating within an active assembly from internal sources are not within the scope of this program.

In LRA Section B2.1.11 on Page B-31, Program Description, the second and third sentences of the first paragraph are revised to read as follows:

> Cable connections terminating within an active or passive device/assembly from external sources are within the scope of this program. Cable/wiring connections terminating within an active assembly from internal sources are not within the scope of this program.

Based on its review, the staff finds the applicant's response to RAI B.2.1.11-1 acceptable. The exception to the "scope of program" program element is acceptable because it is consistent with what is proposed in the final revision of LR-ISG-2007-02. The staff noted that the connection to an internal of an active assembly is considered as a part of the active assembly therefore does not require an AMR. The exclusion of high-voltage connections (>35 kV) in the "scope of program" program element is acceptable because high-voltage connections are addressed elsewhere in the SER under switchyard connections. The staff also finds the exception to the "parameters monitored or inspected," program element acceptable because the exception is consistent with the staff's clarifications provided in LR-ISG-2007-02. The sample of connections considered does not include the high-voltage application and low circuit loading because the aging effect of loosening of cable connections due to thermal cycling is insignificant for low load circuits because of low currents. The staff noted that high-voltage connections are addressed elsewhere in the SER under switchyard connections. In addition, the staff finds the exception to the “detection of aging effects” program element acceptable because this is a one-time inspection on a sampling basis instead of periodic inspections as currently recommended in GALL AMP XI.E6.

In reviewing OE to address industry comments about GALL AMP XI.E6, the staff finds that few OEs related to failed connections are due to human errors or maintenance practices. The staff noted that the OE cannot support a periodic inspection as currently recommended in GALL AMP XI.E6. However, because there have been limited number of age-related failures of cable connections, a one-time inspection of the metallic portion of electrical cable connections is warranted. On this basis, the staff issued LR-ISG-2007-02 to provide clarification and recommend a one-time inspection on a representative sampling basis to ensure that either aging of metallic cable connections is not occurring or existing preventive maintenance is effective such that a periodic inspection is not needed.

The staff also finds that the proposed amendments in LRA Sections A2.11 and B2.1.11 acceptable because the applicant provided clarification of the scope of cable connections to be included in Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements. These clarifications are consistent with those in the staff’s LR-ISG-2007-02. The staff’s concern described in RAI B.2.1.11-1 is resolved.

Based on its review, the staff finds that the AMP, with the exceptions, is adequate to manage the aging effect for which it is credited.

Operating Experience. The staff reviewed the OE described in LRA Section B2.1.11. The applicant states that a review of PINGP OE identified one significant connection failure that resulted in a fire. The cause of this failure was determined to be from either improper re-silvering of the bus contacts, improper connection during maintenance activities, and/or a manufacturers' design flaw (tulip connection) where connection pieces may break (unnoticed) during reconnection activities. None of the failure causes were age-related, but the detrimental effects of the improper connection heightened the awareness and importance of having sound electrical connections (regardless the cause of that loose connections), and resulted in an expansion of the number of electrical connections periodically inspected under the PINGP Thermography Program. The applicant also stated that the Corrective Action Program evaluation also investigated similar connections in detail, and found no similar loose connections that would lead to circuit failure or fire. A procedure change was made to include an acceptable and consistent contact re-silvering process.

The staff reviewed the OE provided in LRA and in the basis documents that were available during the audits. Based on the review of the applicant-identified OE, the staff has confirmed that the applicant has taken appropriate correction actions to address the cable connection issue. Therefore, the staff determines that the applicant has adequately addressed this element. 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 A2.1.11, the applicant provided the UFSAR supplement for the AMP Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed this section and determines that the information in UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

The applicant committed to implement this AMP prior to the period of extended operation and identified it as LRA Commitment No. 8.

Conclusion. On the basis of its audit and reviews of the applicant Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirement 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 determined that the AMP, with the exceptions, is adequate to manage the aging effect for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 External Surfaces Monitoring

Summary of Technical Information in the Application. LRA Section B2.1.14 describes the applicant's existing External Surfaces Monitoring Program as consistent, with enhancements, with GALL AMP XI.M36, "External Surfaces Monitoring." The applicant stated that this program is credited to manage loss of material, cracking, change in material properties, and heat transfer degradation for applicable metallic and non-metallic components. The applicant further stated that this program will utilize periodic visual inspections during system walkdowns and inspections for the accessible external surfaces for components that are within the scope of this program. The applicant stated that this program will be credited for managing degradation of internal surfaces for those situations where the external surfaces condition is representative of the conditions on the external surface, consistent with the recommendations provided in GALL AMP XI.M36.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancements to determine whether the AMP, with the enhancements, is adequate to manage the aging effects for which the LRA credits it. The staff's summary of its on-site review of AMP B2.1.14 is documented in staff's Audit Summary Report Section for this AMP. The applicant claims that the AMP B2.1.21 is consistent with GALL AMP XI.M36, "External Surfaces Monitoring," with enhancements

In comparing the seven program elements in the applicant's program to those in GALL AMP XI.M36, the staff noted that the program elements in which 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 those portions of the program elements that related to the enhancements and additional areas in which the staff determined there was a need for additional information and clarification for which a RAI was issued.

Enhancement 1. In LRA Section B2.1.14, the applicant stated that the program element, scope of program, for the External Surfaces Monitoring Program will be enhanced prior to the period of extended operation. The applicant's enhancement to the scope of program states that:

> The scope of program will be expanded as necessary to include all metallic and non-metallic components within the scope of License Renewal that require aging management in accordance with this program.

The staff noted that the scope of GALL AMP XI.M36, "External Surfaces Monitoring," is applicable only to the management of loss of material in components that are fabricated from steel materials or to degradation of their external liners or coatings, if the designs include these features. However, the staff noted that the applicant is proposing to expand the scope of this program to include several other metallic and non-metallic components. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant to do:

(a) provide an appropriate program to manage non-metallic components and their associated aging effects;

(b) justify why the aging effect of heat transfer degradation due to fouling as it applies to the additional metallic components added to the scope of this program is not considered an enhancement to this program element; and

(c) justify how this program will adequately manage the aging effects of loss of material and heat transfer degradation as it applies to the additional metallic components added to the scope of this program

The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008. In its response to (a) of RAI B2.1.14-1, the applicant stated that the aging effects in non-metallic materials can be detected by a visual inspection evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant further stated that a physical manipulation of non-metallic components will supplement the visual examination in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff noted that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, by the relative inflexibility of the component, or by the failure of the component to return to its previous shape or configuration.

During its review of the applicant's response the staff noted that the applicant did not amend Commitment No. 11 to indicate that a physical manipulation will supplement a visual inspection when appropriate. During a teleconference on January 22, 2009, the applicant stated that it will amend Commitment No. 11 to indicate physical manipulation will supplement the visual inspection when appropriate. By letter dated April 13. 2009, the applicant amended Commitment No. 11 to indicate physical manipulation will supplement a visual inspection when appropriate. On the basis of its review, the staff finds the applicant's response acceptable because (1) the applicant will supplement the visual inspection for non-metallic components with a physical manipulation, when appropriate, which is capable of detecting age-related degradation for non-metallic components as described above and (2) the applicant amended its

Commitment No. 11 to specifically indicate that a physical manipulation of non-metallic components will supplement the visual examination, when appropriate.

The applicant stated in its response to (b) of B2.1.14-1 that this program is only credited for the management of heat transfer degradation due to fouling of the external surfaces of cooling coils that are exposed to an external air environment (plant indoor air or primary containment air). The staff noted that the visual examinations performed as part of this program will be capable of identifying corrosion, discoloration and accumulation of dirt/debris, which is consistent with the intention of GALL AMP XI.M36. The staff noted that indications of corrosion, discoloration and accumulation of dirt/debris are indicative of fouling on the cool coil external surface and has the potential to lead to heat transfer degradation. The staff noted that because the program will be capable of identifying corrosion, discoloration and accumulation of dirt/debris that are indicative of heat transfer degradation due to fouling that the addition of this aging effect to the scope of the program is not considered an enhancement. On the basis of its review the staff finds the applicant's response and this augmentation to be acceptable because the applicant's program consists of visual examinations, consistent with GALL AMP XI.M36, which are capable of detecting fouling (buildup from whatever source) which may potentially degrade the heat transfer capability of the cooling coil surface to the external air environment.

The applicant stated in its response to (c) of RAI B2.1.14-1 that a visual inspection that is performed during activities of this program will be capable of identifying loss of material for metallic components (aluminum, copper alloy, copper-nickel, chrome-molybdenum alloy, carbon steel with stainless steel clad) other than steel. The applicant further stated that the visual inspection performed during activities of this program will monitor parameters such as corrosion wastage, oxidation, discoloration, cracking, coating degradation, accumulation of dirt/debris, evidence of leakage, surface discontinuities and pitting that are indicative of loss of material. The staff noted that metallic components other than 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 staff further noted that the these visual inspections will be performed by the applicant's staff that are qualified to perform the activities of the visual inspection in accordance with site controlled procedures and processes at least once per refueling cycle. Furthermore, deficiencies, problems and concerns are documented and corrective actions are taken as appropriate, which is consistent with the program elements, (1) detection of aging effects and (2) monitoring and trending, of GALL AMP XI.M36. On the basis of its review, the staff finds that the applicant's basis for aging management, as amended in the RAI response, to be 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) these visual inspections will be performed at least once per refueling cycle by the applicant's staff that has been qualified in accordance with site controlled procedures and processes, which is consistent with GALL AMP XI.M36.

The staff verified that the applicant has incorporated this enhancement of the AMP in LRA Commitment No. 11, which was placed on UFSAR Supplement for the LRA in a letter dated April 13. 2009.

On the basis of its review, the staff finds the applicant's response to RAI B2.1.14-1, and enhancement of the program in Commitment No. 11 to be acceptable in its entirety, and therefore the applicant's enhancement acceptable.

Enhancement 2. In LRA Section B2.1.14 the applicant states that the program element, scope of program, for the External Surfaces Monitoring Program must be enhanced in order to be consistent with GALL XI.M36 "External Surfaces Monitoring." The applicant's enhancement to the scope of program states that:

> The program will be enhanced to ensure that surfaces that are inaccessible or not readily visible during plant operations will be inspected during refueling outages.
>
> The program will be enhanced to ensure that surfaces that are inaccessible or not readily visible during both plant operations and refueling outages will be inspected at intervals that provide reasonable assurance that aging effects are managed such that applicable components will perform their intended functions during the period of extended operation.

The staff reviewed the applicant's enhancement and compared it to the recommendations provided in GALL AMP XI.M36. The staff noted that the applicant's proposed enhancements are consistent with the recommendations provided in the GALL AMP XI.M36. On the basis of its review, the staff finds the applicant's enhancement to be acceptable because when the applicant's program is enhanced as described above prior to the period of extended operating, this program will be consistent with the recommendations provided in the program element, "scope of program" element in GALL AMP XI.M36.

The staff verified that the applicant has incorporated this enhancement of the AMP in LRA Commitment No. 11, which was placed on UFSAR Supplement for the LRA in a letter dated April 13. 2009. On the basis of its review, the staff finds the applicant's response to RAI B2.1.14-1, and enhancement of the program in Commitment No. 11 to be acceptable in its entirety, and, therefore, the applicant's enhancement acceptable.

Enhancement 3. By letter dated February 6, 2009 the applicant amended its LRA to include an additional enhancement to its program. The applicant's enhancement to the program element, detection of aging effects program element states that [t]he program will apply physical manipulation techniques, in addition to visual inspection, to detect aging effects in elastomers and plastics.

The staff noted that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of elastomers and plastics, when appropriate, 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 the applicant's enhancement acceptable because the applicant will supplement the visual inspection for elastomer and plastic components with a physical manipulation, when appropriate, which is capable of detecting age-related degradation for non-metallic components as described above.

The staff verified that the applicant has incorporated this enhancement of the AMP in LRA Commitment No. 11, which was placed on UFSAR Supplement for the LRA in a letter dated April 13. 2009.

Enhancement 4. By letter dated February 6, 2009, the applicant amended its LRA to include an additional enhancement to its program. The applicant's enhancement to the acceptance criteria program element states that:

> The program will include acceptance criteria (e.g. threshold values for identified aging effects) to ensure that the need for corrective actions will be identified before loss of intended functions.

The program element, acceptance criteria, of GALL AMP XI.M36 recommends that for each component/aging effect combination, the acceptance criteria are defined to ensure that the need for corrective actions will be identified before loss of intended functions. The staff reviewed the applicant's program basis documents and this enhancement and finds that the implementation of this enhancement will make the applicant's program consistent with the GALL AMP XI.M36.

The staff verified that the applicant has incorporated this enhancement of the AMP in LRA Commitment No. 11, which was placed on UFSAR Supplement for the LRA in a letter dated April 13. 2009.

Enhancement 5. By letter dated February 6, 2009, the applicant amended its LRA to include an additional enhancement to its program. The applicant's enhancement to the administrative controls program element states that:

> The program will ensure that program documentation such as walkdown records, inspection results, and other records of monitoring and trending activities are auditable and retrievable.

The program element, administrative controls, of GALL AMP XI.M36 and 10 CFR Part 50, Appendix B, provides the acceptable recommendations for this program element. The staff reviewed the applicant's program basis documents and this enhancement and finds that the implementation of this enhancement will make the applicant's program consistent with the GALL AMP XI.M36 and 10 CFR Part 50, Appendix B, such that system walkdown records, inspection results and other records associated with this program were retrievable and auditable.

On the basis of its review of the applicant's program, together with review of the enhancements and RAI B.2.14-1 as described above, the staff finds the External Surfaces Monitoring Program consistent with the program elements of GALL AMP XI.M36 with acceptable enhancements, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.14 and the applicant's CRs during the on-site audit and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. During its review of the applicant's OE the staff noted that the applicant identified the fan coil unit (FCU) supply/return flanges were corroded in May 2005. The applicant identified the corrosion and then performed an evaluation to either replace or resurface the flange. The applicant later found several other flanges with similar conditions of degradation. The applicant further stated that based on the evaluation it performed these flanges that corroded were subsequently repaired/resurfaced by machining. The staff noted that the applicant had taken appropriate corrective actions to resurface the affected areas by machining after discovery of the degradation of the FCU supply/return flanges.

During its review of the applicant's OE the staff noted that in September 2007 the applicant discovered there was a boric acid leakage on valve CV-31213. It was later determined by the applicant that the boric acid was located on stainless steel materials, which is resistant to boric acid corrosion. The applicant subsequently repaired the leak and cleaned any of the residual dry boric acid from the stainless steel surface. The staff noted that the applicant was capable of identifying the leakage and then initiated corrective actions to repair the source of the leak and clean any remaining boric acid on the surface of the valve.

The applicant also noted that during a surveillance test (diesel generator monthly slow start) on October 2006 that there was a leak at the 2EG-9-16 valve. The applicant's evaluation noted that this type of leak may put them in an unplanned limiting condition for operation. The applicant initiated corrective actions to have the leak repaired by the "Fix It Now" team in November 2006. The staff noted in this situation the applicant was capable of identifying leakage and then initiating corrective actions to have the leak from the valve repaired.

The staff reviewed the OE provided in the LRA and interviewed the applicant's technical personnel regarding the generic and plant-specific OE that is applicable to this AMP. The staff confirmed that the applicant had taken appropriate corrective actions for the OE that are applicable to the External Surfaces Monitoring Program. The staff also noted that there was not any aging effects or age-related degradation that could not be detected with the AMP's inspection and physical manipulation methods or that are not bounded by the ability of the AMP to detect the aging effects. The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A2.14, the applicant provided the UFSAR supplement for the External Surfaces Monitoring Program. The staff reviewed the supplement and verified that, in LRA Commitment No. 11 of the License Renewal Commitments in a letter dated April 13, 2009, the applicant committed to implementing this program and its enhancements prior to the period of extended operation as described in LRA Section B2.1.14. The staff finds the UFSAR supplement for this AMP 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, as committed to in LRA Commitment No. 11.

The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's External Surfaces Monitoring Program, the staff 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. 11 prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 Fire Protection Program

Summary of Technical Information in the Application. LRA Section B2.1.15 describes the Fire Protection Program as an existing program that is consistent with an exception and enhancements with GALL AMP XI.M26, “Fire Protection.” The applicant stated that the Fire Protection Program is a condition monitoring program that consists of fire barrier inspection activities, diesel-driven fire pump inspection activities and halon/carbon dioxide (CO_2) fire suppression system inspection activities. The applicant also stated that the fire barrier inspection activities include (1) periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic inspection and functional testing of all fire-rated doors that perform a fire barrier function to ensure that their operability and intended functions are maintained; (2) periodic pump performance testing to ensure that the fuel supply line can perform its intended function; and (3) periodic inspection and functional testing of the halon/CO_2 fire suppression system to manage the aging effects and degradation that may affect the intended function and performance of the system.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff’s summary of its on-site review of AMP B2.1.15, Fire Protection Program, is documented in staff’s Audit Summary Report Section for this AMP.

The staff reviewed the exception and enhancements to determine whether the AMP, with the exception and 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 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, with the exception of two program element aspects. These program element aspects are identified below and the staff determined there was a need for additional clarification. The staff also confirmed that the plant program contains all of the elements of the referenced GALL program. On-site interviews were also held to confirm these results.

The Fire Protection Program basis document states that the diesel-driven fire pump inspection activities require that the pump be periodically performance tested. PINGP credits the Fire Protection Program to manage cracking in the fuel oil lines. The staff issued RAI B2.1.15-1 by letter dated November 5, 2008, requesting the applicant to explain how the periodic performance test will manage the aging effect of cracking in the fuel oil lines.

In its letter dated December 5, 2008, in response to RAI B2.1.15-1, the applicant stated that as recommended in GALL AMP XI.M26, "Fire Protection," program element 4, periodic performance tests of the diesel-driven fire pump are conducted to ensure fuel supply line performance. The applicant also stated that the fuel oil supply line intended function is confirmed by starting and running the diesel-driven fire pump for 30 minutes every week and that the periodic pump performance test provides an indirect means of verifying the absence of fuel line cracking by confirming satisfactory pump performance.

The staff finds the applicant response acceptable because the diesel-driven fire pump is under observation during the performance tests such as flow and discharge tests, and sequential starting capability tests and any age-related degradation such as leakages will be documented and evaluated. The staff finds this response consistent with GALL AMP XI.M26 recommendations that the pump be periodically performance tested to ensure that the fuel supply line can perform its intended function. Thus, RAI B2.1.15-1 is resolved.

The GALL AMP XI.M26's “acceptance criteria” program element recommends that no corrosion is acceptable in the fuel supply line for the diesel-driven fire pump. Acceptance criteria element under Section 5.6 of the program basis document states that the diesel driven-fire pump is flow tested to ensure there is no indication of internal fuel supply line corrosion. The staff issued RAI B2.1.15-2 by letter dated November 5, 2008, requesting the applicant to explain how the flow test will ensure there is no corrosion.

The staff finds the applicant response acceptable because the diesel-driven fire pump is under observation during the performance tests such as flow and discharge tests, and sequential starting capability tests and any age-related degradation such as corrosion would impact flow, and will be documented and evaluated. The staff finds this response consistent with GALL AMP XI.M26 recommendations that the pump be periodically performance tested to ensure that the fuel supply line can perform its intended function. Thus, RAI B2.1.15-2 is resolved.

Exception. The applicant has taken an exception to the “parameters monitored/inspected” program element stating that:

> The Relay/Cable Spreading Room and Computer Room CO_2 System is functionally tested and visually inspected every 18 months instead of every six months as recommended in NUREG-1801, XI.M26. The surveillance interval is specified in the NRC-approved fire protection program, which is an element of the plant's licensing basis, and is historically traceable to the plant Technical Specifications. Functional testing and visual inspections performed every 18 months are sufficient to identify material conditions that may affect the performance of the system.
>
> The halon system smoke detectors in the computer room and the Old Administration Building vault are functionally tested every 3 and 5 years respectively, instead of every six months as recommended in NUREG-1801, XI.M26. Functional testing the smoke detectors in the computer room and vault every 3 and 5 years respectively, will be sufficient to identify degradation that may affect the performance of the systems.

The applicant stated that the frequencies of Relay/Cable Spreading Room and Computer Room CO_2 System are based on the CLB at PINGP. The staff reviewed the applicant’s program basis document and determined that the applicant's current licensing bases are captured in Document F5, Appendix K, Fire Protection System Operability Requirements. The staff noted that Document F5, Appendix K, Section 8.7.2 states that the system is verified operable by performing a system functional test every 18 months, and Section 8.7.1 states that CO_2 storage tank level and pressure are verified every week. The staff also reviewed the applicant's OE report and did not find any age-related degradation in the halon and CO_2 systems. On the basis of its review and that the applicant is (1) performing functional tests in accordance with its CLB, which would identify if the smoke detectors are performing their intended function, (2) performing weekly visual inspection of CO_2 system storage tank level and pressure check, which would identify any age-related degradation, and (3) based on the plant-specific OE that did not find any age-related degradation in the halon system, the staff finds that these inspection and testing frequencies are adequate to ensure the Relay/Cable Spreading Room and Computer Room CO2 system maintains its function. Therefore, the staff finds the exception acceptable.

In the case of the halon system smoke detectors, the staff issued RAI B2.1.15-3 by letter dated November 5, 2008, requesting the applicant to provide a basis for using a different frequency than the GALL Report recommended frequency of testing once every six months.

In its letter dated December 5, 2008, in response to RAI B2.1.15-3, the applicant stated that:

> The three halon fire suppression systems at PINGP afford protection to the service building computer room, guardhouse, and the old administration building records vault. As defined in the PINGP fire hazards analysis, a fire in these plant areas would have no effect on the safe shutdown capability of the plant. In the case of a service building computer room fire, an old administration building records vault fire, or a guardhouse fire, all Unit 1 and Unit 2 safe shutdown functions would remain available from the Control Room. Additionally, no process monitoring instrumentation in the Control Room would be affected by fires in these areas. As described in PINGP UFSAR Section 10.3.1.3.1, the performance description and operability requirements of the fire detection and fire protection systems are described in and governed by the PINGP Operations Manual. There are no specific operability or surveillance requirements defined for the three halon suppression systems in the Operations Manual.
>
> The three halon fire suppression systems are visually inspected every six months to ensure adequate halon availability by verifying the level of each halon cylinder. In addition, the smoke detectors in the service building computer room are functionally tested every three years. The smoke detectors in the guardhouse and the old administration building records vault are functionally tested every five years. The enhancement in the PINGP LRA, Appendix B2.1.15, that states that the Fire Protection Program will be enhanced to require functional testing of the halon system smoke detectors in the guardhouse every 5 years, is in error. PINGP has determined that the halon system smoke detectors in the guardhouse are already being functionally tested every 5 years, and this enhancement is unnecessary.

The applicant also determined that the exception discussed in LRA Section B2.1.15 related to halon testing required revision. Accordingly, the applicant revised the exception.

In LRA Section B2.1.15 on Page B-39, under Exceptions to the GALL Report, the second paragraph under Parameters Monitored/Inspected is revised in its entirety to read as follows:

> The halon system smoke detectors in the service building computer room are functionally tested every 3 years and those in the old administration building records vault and guardhouse are functionally tested every 5 years, instead of every six months as recommended in NUREG-1801, XI.M26. Functional testing of the smoke detectors in the computer room every 3 years and those in the vault and guardhouse every 5 years will be sufficient to identify degradation that may affect the performance of the systems.

The applicant further stated that:

> A review of PINGP OE identified no adverse trends or issues with the halon smoke detectors. The halon smoke detector functional testing frequencies of three and five years in lieu of every six months as recommended by NUREG-1801, is based on the maintenance history for each of the three systems. Agreement on these functional testing frequencies has been reached with the PINGP insurance underwriter, Nuclear Electric Insurance Limited (NEIL).
>
> Functional testing of the halon smoke detectors in the service building computer room every three years, and testing of those in the guardhouse and the old administration building records vault every five years, will be sufficient to identify degradation that may affect the performance of the systems. The halon systems will also be inspected periodically at a frequency of at least once per refueling cycle by the External Surfaces Monitoring Program for corrosion and mechanical damage.

The staff reviewed the applicant's response and noted that the halon smoke detectors are located in areas where a fire would not have any effect on the safe shutdown capability of the plant. The staff reviewed the applicant’s program basis document and determined that the applicant’s current licensing bases are captured in Document F5, Appendix K, Fire Protection System Operability Requirements. The staff reviewed the Fire Protection System Operability Requirements and noted that there are no specific operability or surveillance requirements defined for the three halon suppression systems in the Operations Manual. The staff verified that three halon suppression systems are inspected every six months, which is in accordance with GALL AMP XI.M-26 recommendations.

The staff reviewed the plant's OE and noted that there was no age-related degradation identified for the halon and carbon dioxide systems. The staff also reviewed the revision to the second paragraph of the exception and finds that it provides more clarity to the different frequencies used for the three smoke detectors.

On the basis that the applicant is performing visual inspections once every six months consistent with GALL AMP XI.M26 recommendation, periodic internal surface inspections every refueling outage and based on the plant OE that did not identify any age-related degradation, the staff finds that the three-year and five-year testing intervals are adequate to ensure the system maintains its function and finds the exception acceptable.

Enhancement 1. In LRA Section B2.1.15, the applicant included an enhancement in the "parameters monitored/inspected" program element to require functional testing of the halon system smoke detectors in the guardhouse every five years.

However, in its response to RAI B2.1.15-3, the applicant stated that halon system smoke detectors in the guardhouse are already being functionally tested every five years, and this enhancement is unnecessary. The applicant revised the LRA and deleted the enhancement. The applicant also revised the Commitment List to delete this enhancement from Commitment No. 12.

On the basis that the applicant is already performing functional tests of halon smoke detectors in the guardhouse every five years, the staff finds the enhancement is not necessary and therefore finds the deletion of the enhancement to be acceptable.

Enhancement 2. In LRA Section B2.1.15, the applicant included an enhancement in the "detection of aging effects" program element to require periodic visual inspection of the fire barrier walls, ceilings, and floors to be performed during walkdowns at least once every refueling cycle.

The staff verified that the applicant has included Commitment No. 12 in the commitment list to enhance the program to require periodic visual inspection of the fire barrier walls, ceilings, and floors to be performed during walkdowns at least once every refueling cycle. This enhancement, when implemented, will make the Fire Protection Program consistent with the GALL AMP XI.M26, which recommends that visual inspection of fire barriers once every refueling cycle ensures timely detection of aging effects. Based on this review, the staff finds the enhancement acceptable.

Based on its review of the exception and enhancements, and resolution of the RAI as described above, the staff finds the Fire Protection Program consistent with program elements of GALL AMP XI.M26, with acceptable exception, and therefore acceptable.

Operating Experience. The staff reviewed the OE provided in LRA Section B2.1.15 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 that was provided in the applicant's license renewal basis document for the Fire Protection Program. The staff reviewed a sample of CRs and confirmed that the applicant had identified age-related degradation in penetration seals, and in the diesel-driven fire pump strainer. The applicant repaired the penetration seals and determined that the strainer failure was due to an active failure of the strainer motor isolation, which required replacement of the overload heaters and to reset them.

In LRA Section B2.1.15, the applicant stated that a review of OE for the Fire Protection Program identified no adverse trends or issues with program performance. The applicant identified a fire door closure issue that was determined to be a generic issue. The applicant stated that modifications were made to fire doors to prevent the recurrence of the doors not closing properly due to inadequate clearances or improper adjustments.

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 system components and structures.

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 A2.15, 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 these types of programs provided in Table 3.4-2 of the SRP-LR.

In its letter dated April 13. 2009, the applicant provided a list of License Renewal Commitments. The staff verified that the applicant has included in the final License Renewal Commitment List, Commitment No. 12, the program enhancement identified in the LRA for the applicant's Fire Protection Program.

Based on this review, the staff determines that UFSAR supplement Section A2.5 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 its audit and review of the applicant's Fire Protection Program and the applicant's response to the staff's RAI, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff also reviewed the enhancement and confirmed that its implementation through Commitment No. 12 prior to the period of extended operation will make the existing AMP consistent with the GALL AMP to which it was compared. In addition, the staff reviewed the exception and its justification and determined that the AMP, with the exception, is adequate to manage the aging effects for which 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).

3.0.3.2.7 Fire Water System

Summary of Technical Information in the Application. LRA Section B2.1.16 describes the Fire Water System Program as an existing program that is consistent with enhancements with GALL AMP XI.M27, “Fire Water System.” The applicant stated that this program manages loss of material due to corrosion, MIC and fouling of the water-based fire protection system and associated components by periodic flushing, flow testing and wall thickness evaluations. The applicant further stated that inspection and testing are performed in accordance with applicable National Fire Protection Association (NFPA) codes and standards, and NRC commitments. The applicant also stated that internal portions of the fire water system are visually inspected when disassembled for maintenance.

Staff Evaluation. During its audit the staff reviewed the applicant’s claim of consistency with the GALL Report. The staff’s summary of its on-site review of AMP B2.1.16, Fire Water System Program, is documented in staff’s Audit Summary Report Section for this AMP.

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 GALL AMP XI.M27, 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.M27. The staff also confirmed that the plant program contains all of the elements of the referenced GALL AMP. On-site interviews were also held to confirm these results.

Enhancement 1. In LRA Section B2.1.16, the applicant included an enhancement in the “detection of aging effects” program element to include eight additional yard fire hydrants in the scope of the annual visual inspection and flushing activities.

The staff reviewed the applicant’s program basis document and determined that these eight additional fire hydrants are identified as additions to the program. The staff verified that the applicant has included Commitment No. 13 in the commitment list to enhance the program to include these eight additional yard fire hydrants in the scope of the annual visual inspection and flushing activities. This enhancement, when implemented, will make the Fire Water System Program consistent with the GALL AMP XI.M27, “detection of aging effects” program element, which recommends visual inspections of yard fire hydrants be performed annually to ensure timely detection of signs of degradation, such as corrosion. Based on this review, the staff finds the enhancement acceptable.

Enhancement 2. In LRA Section B2.1.16, the applicant included an enhancement in the “detection of aging effects” program element to replace sprinkler heads that have been in place for 50 years or a representative sample of sprinkler heads will be tested using the guidance of NFPA 25, “Inspection, Testing and Maintenance of Water-Based Fire Protection Systems” (2002 Edition, Section 5.3.1.1.1). The applicant further stated that sample testing, if performed, will continue at a 10-year interval following the initial testing.

The staff verified that the applicant has included Commitment No. 13 in the Commitment list to enhance the program to require that sprinkler heads that have been in place for 50 years be replaced or a representative sample be tested. This enhancement, when implemented, will make the Fire Water System Program consistent with the GALL AMP XI.M27, which recommends testing or replacement of sprinkler heads in service for 50 years. Based on this review, the staff finds the enhancement acceptable.

Based on its review of the enhancements as described above, the staff finds the Fire Water System Program consistent with program elements of GALL AMP XI.M27, and therefore acceptable.

Operating Experience. The staff reviewed the OE provided in LRA Section B2.1.14 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.

The staff also reviewed the OE provided in the program basis document. During performance of a surveillance test on fire hydrants, the applicant found a fire hydrant leaking from a corroded barrel. The applicant replaced the fire hydrants. During performance of wall thickness measurements on the fire water header, the applicant found a section of pipe below minimum wall thickness. The applicant determined the cause to be loss of material due to MIC in a stagnant portion of the pipe. The applicant performed wall thickness measurements in other fire water headers in stagnant portions of pipe and did not find other areas of similar degradation and determined it was not a generic issue. The applicant replaced the degraded section of pipe with like material.

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 Water System Program, with the corrective actions discussed in the LRA and the program basis document, has been effective in identifying, monitoring, and correcting the effects of age-related degradation in fire water system components and structures.

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 A2.16, 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.

In its letter dated April 13. 2009, the applicant provided a list of License Renewal Commitments. The staff verified that the applicant has included in the final license renewal commitment list, Commitment No. 13, the program enhancements identified in the LRA for the applicant's Fire Water System Program.

Based on this review, the staff finds that UFSAR supplement Section A.2.1.14 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 its review of the applicant's Fire Water System Program, the staff finds those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the enhancements and confirmed that their implementation through Commitment No. 13 prior to the period of extended operation will make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging 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).

3.0.3.2.8 Flux Thimble Tube Inspection

Summary of Technical Information in the Application. LRA Section B2.1.18 describes the applicant's existing Flux Thimble Tube Inspection Program as consistent, with enhancements, with GALL AMP XI.M37, "Flux Thimble Tube Inspection." The applicant stated that the Flux Thimble Tube Inspection Program is a condition monitoring program that manages loss of material due to wear for in-core instrument thimble tubes. The program requires periodic ECT of thimble tubes for thinning of the flux thimble tube wall due to flow-induced fretting and provides for evaluation and trending of inspection results and implementation of corrective actions. The applicant also stated that this program implements the commitments made in the applicant's response to NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors."

Staff Evaluation. During the audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the applicant's existing program and the proposed enhancements to determine whether the AMP, with the enhancements, is adequate to manage the aging effects for which the LRA credits it.

The staff reviewed the applicant's program basis document, on-site procedures, corrective action reports, and other plant documents that were included in the applicant's license renewal program basis document binder for the Flux Thimble Tube Inspection Program and that contained relevant information supporting the applicant's evaluation of this AMP.

The staff noted that the applicant's Flux Thimble Tube Inspection Program manages the aging effect of loss of material due to wear for in-core instrument thimble tubes. The flux thimble tubes provide a travel path for insertion of the incore neutron flux monitoring system detectors and form part of the reactor coolant pressure boundary. As discussed in NRC Information Notice 87-44, Supplement 1, "Thimble Tube Thinning in Westinghouse Reactors," dated March 28, 1988, flux thimble tubes have experienced loss of material (wall thinning) due to wear caused by flow-induced vibrations, and flux thimble tube wear has generally been detected at locations associated with geometric discontinuities or areas of change along the flux thimble tube's axial length, such as areas near the lower core plate, the core support forging, the lower tie plate, the upper tie plate, and the vessel penetration.

The staff also noted that the applicant's Flux Thimble Tube Inspection Program conducts inspections to monitor for wall thinning of the flux thimble tubes and that the program includes provisions for repositioning or capping flux thimble tubes that do not meet acceptable criteria to ensure that the integrity of the reactor coolant pressure boundary is maintained. The staff noted that when wear becomes excessive, corrective actions are taken to axially reposition the flux thimble tube so that the worn area is moved away from the geometric discontinuity if wall thickness remains acceptable, to remove the flux thimble tube from service and cap the tube so as to prevent degradation of the reactor coolant pressure boundary, or to replace the flux thimble tube. The staff finds these features of the applicant's Flux Thimble Tube Inspection Program to be acceptable because they are consistent with recommendations for "correction actions" in GALL AMP XI.M37, Flux-Thimble Tube Inspection.

The staff further noted that the applicant's Flux Thimble Tube Inspection Program encompasses all of the flux thimble tubes that form part of the reactor coolant system pressure boundary. The staff also noted that the applicant's program calls for the applicant to inspect all flux thimble tubes that are currently inservice (non-capped) using ECT methodology at each refueling outage in order to detect any wall thinning in the flux thimble tubes, and to establish a thimble tube wear projection based on a comparison of the newly recorded wall thickness data with that obtained from prior examinations of the thimble tubes. The staff also noted that any significant changes in the percentage of tube wall loss are compared against acceptance criteria, and affected flux thimble tubes are evaluated for repositioning, capping or replacement. The staff noted that flux thimble tubes that do not meet the acceptance criteria are repositioned, capped or replaced to ensure that the integrity of the reactor coolant pressure boundary is maintained. The staff finds these features of the applicant's Flux Thimble Tube Inspection Program to be consistent with "detection of aging effects," "monitoring and trending," and "corrective actions" program element recommendations in the GALL AMP XI.M37.

In a letter dated November 5, 2008, the staff issued RAI AMP-B2.1.18-1 asking the applicant to provide additional information with regard to its "acceptance criteria" program element, stating current acceptance criteria values and basis, and clarifying whether wear rate projections are based on plant-specific or generic wear data.

The applicant responded to the RAI in a letter dated December 5, 2008. In its response the applicant stated that any flux thimble tube measuring greater than or equal to 80 percent through wall loss is required to be capped, and any flux thimble tube measuring greater than or equal to 60 percent through wall loss is repositioned, or capped if the trend is approaching the capping criteria. The applicant stated that the values of 80 percent for capping and 60 percent for repositioning are conservative relative to values documented in Proprietary WCAP-12866, "Bottom Mounted Instrumentation Flux Thimble Tube Wear," which documented that flux thimble tubes retain functional and structural integrity up to 85 percent wall loss. The applicant also stated that all flux thimble tubes are inspected at every refueling outage and that this inspection frequency has been in place since 1987. The applicant further stated that unit-specific wear rate data is used for flux thimble tube wear projections.

The staff noted that the applicant's acceptance criteria of 80 percent through wall loss for capping and 60 percent through wall loss of repositioning of flux thimble tubes includes allowances for factors such as instrument uncertainty, uncertainties in wear scar geometry and other potential uncertainties as recommended in GALL AMP XI.M37. The staff finds these acceptance criteria to be acceptable because they have been established based on actual thimble tube burst test data that has been compiled by the industry and referenced in Proprietary WCAP-12866 and because the applicant's 80 percent acceptable wall loss acceptance criterion account for eddy current instrument uncertainty is consistent with the "acceptance criteria" program element in GALL AMP XI.M37. The staff also finds that the applicant's uses of unit-specific wear rate projection is consistent with recommendations of the GALL Report. On this basis, the staff finds the applicant's response resolved all issues in RAI AMP-B2.1.18-1 and are acceptable.

The staff compared program elements in the applicant's program to those in GALL AMP XI.M37 and found that the program elements in the AMP that the applicant claims to be consistent with the GALL Report are consistent with the corresponding program element criteria recommended in GALL AMP XI.M37. Except for the enhancements described in the LRA by the applicant and discussed below, the staff did not identify any differences between recommendations in the GALL Report and the applicant's consistency claims.

Enhancement 1. LRA Section B2.1.18 states an enhancement to the "monitoring and trending" program element. The applicant stated that the program will be enhanced to require that the interval between inspections be established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection.

During the on-site audit of this program, the staff noted that the applicant's current process already requires flux thimble tube inspections such that no flux thimble tube is predicted to exceed criteria before the next inspection. Subsequently the staff asked the applicant to clarify the intention of Enhancement 1. In its clarification, the applicant stated that the enhancement is a procedure change to formally incorporate existing practices into appropriate implementing procedures. The staff confirmed that the applicant has incorporated this enhancement of the program in LRA Commitment No. 14, which was placed on the UFSAR Supplement in the applicant's letter of April 13, 2009.

The staff finds Enhancement 1 to be acceptable because it formally incorporates existing practices into appropriate required implementing procedures that are consistent with recommendations in the GALL Report.

Enhancement 2. LRA Section B2.1.18 states a second enhancement to the "monitoring and trending" program element. The applicant stated that the program will require that re-baselining of the examination frequency be justified using plant-specific wear rate data unless prior plant-specific NRC acceptance for the re-baselining was received. If design changes are made to use more wear-resistant thimble tube materials, sufficient inspections will be conducted at an adequate inspection frequency for the new materials.

During the on-site audit of this program, the staff noted that the applicant's current process already requires baselining of the flux thimble tube examination frequency based on plant-specific data and that flux thimble tube wear rates and wear rate predictions are updated at each outage based on newly acquired plant-specific data. Subsequently the staff asked the applicant to clarify the intention of Enhancement 2. In its clarification, the applicant stated that the enhancement is a procedure change to formally incorporate existing practices into appropriate implementing procedures. The staff confirmed that the applicant has incorporated this enhancement of the program in LRA Commitment No. 14 that was placed on the UFSAR Supplement in the applicant's letter of April 13, 2009.

The staff finds Enhancement 2 to be acceptable because it formally incorporates existing practices into appropriate required implementing procedures that are consistent with recommendations in the GALL Report.

Enhancement 3. LRA Section B2.1.18 states an enhancement to the "corrective actions" program element. The applicant stated that the program will require that flux thimble tubes that cannot be inspected must be removed from service.

During the on-site audit, the staff asked the applicant whether there currently are any flux thimble tubes that cannot be inspected and whether those flux thimble tubes currently are capped and removed from service. The applicant responded that they have been unable to perform inspection of one thimble tube in Unit 2 using its current ECT methodology and that thimble tube has been capped and removed from service.

Subsequently the staff asked the applicant to clarify the intention of Enhancement 3. In its clarification, the applicant stated that the enhancement is a procedure change to formally incorporate existing practices into appropriate implementing procedures.

Based on the applicant's response and current treatment of flux thimble tubes that cannot be inspected, the staff finds Enhancement 3 to be acceptable, because it formally incorporates existing practices into appropriate required implementing procedures that are consistent with recommendations in the GALL Report.

The staff finds the applicant's Enhancements 1, 2, and 3 to be acceptable because the enhancements formally incorporate existing practices into appropriate required procedures that are consistent with the program element recommendations in GALL AMP XI.M37, "Flux Thimble Tube Inspection," and because the applicant has incorporated these commitments into Commitment No. 14 of the UFSAR Supplement for the LRA, which was submitted in the applicant's letter of April 13. 2009. The staff finds that the applicant's Flux Thimble Tube Inspection Program, when enhanced, is consistent with GALL AMP XI.M37 and is therefore acceptable.

Operating Experience. The staff reviewed the OE described in LRA Section B2.1.18. The applicant stated that a review of OE for the Flux Thimble Tube Inspection Program identified no adverse trends or issues with program performance. The applicant stated that no thimble tubes have had a through wall leak and that one thimble tube in Unit 2 currently is capped. The applicant also stated that in 2002 a thimble tube in Unit 1 exhibited a significant increase in new wear and was capped to reduce the risk of leaking; however, the wear rate later stabilized, and the thimble tube was subsequently uncapped. The applicant further stated that thimble tubes have been replaced in both Unit 1 and Unit 2 because of difficulty in the movement of the incore neutron detectors, but that the replacements were not due to age-related wear.

The staff reviewed the OE discussion that was provided in the applicant's license renewal program basis document binder for the Flux Thimble Tube Inspection Program. The staff confirmed that the applicant's review of OE included evaluation of both industry and plant-specific events that have occurred since issuance of the GALL Report, Revision 1. The staff reviewed completed inspection procedures and selected corrective action reports related to the applicant's Flux Thimble Tube Inspection 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.

Based on this review, the staff finds (1) that the OE for this AMP demonstrates that the applicant's Flux Thimble Tube Inspection Program is achieving its objective of monitoring for thinning of the flux thimble tube wall using ECT methodology consistent with the recommendations in NRC Bulletin 88-09, 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 A2.18 the applicant provided the UFSAR supplement for the Flux Thimble Tube Inspection Program. The staff verified that the UFSAR supplement summary for the Flux Thimble Tube Inspection Program conforms to the staff's recommended UFSAR supplement for this type of program as described in the SRP-LR.

In its letter dated April 13, 2009, the applicant provided a list of License Renewal Commitments. The staff verified that the applicant has included the program enhancements for the Flux Thimble Tube Inspection Program in Commitment No. 14 of this letter.

Based on this review, the staff finds that the UFSAR supplement summary in LRA Section A2.18 provides an acceptable description of the applicant's Flux Thimble Tube Inspection Program because it is consistent with the UFSAR supplement summary description in the SRP-LR for the Flux Thimble Tube Inspection Program and because the enhancements for this AMP have appropriately been placed onto the UFSAR Supplement for the application.

The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Flux Thimble Tube Inspection Program and the applicant's response to RAI AMP-B2.18-1, 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 enhancements and confirms that their implementation through Commitment No. 14, prior to the period of extended operation, makes the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Fuel Oil Chemistry

Summary of Technical Information in the Application. LRA Section B2.1.19 describes the applicant's existing Fuel Oil Chemistry Program as consistent, with exceptions and enhancements. The Fuel Oil Chemistry Program manages the aging effects of loss of material and cracking on internal surfaces of the diesel fuel oil system piping, piping components and tanks by minimizing the potential for a corrosive environment, and by verifying that the actions taken to mitigate corrosion are effective. The program includes testing to detect unacceptable level of water, sediment and particulate contamination, periodic draining, cleaning and inspection of fuel oil tanks, and one-time ultrasonic inspections of selected tank bottom and piping locations.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and enhancements to determine whether the AMP, with the exceptions and enhancements, is adequate to manage the aging effects for which the LRA credits it.

LRA Section B2.1.19 provides the program description, statement of consistency with the GALL Report, OE, and the conclusion that the PINGP Fuel Oil Chemistry AMP after implementation of enhancements will provide reasonable assurance that loss of material will be adequately managed through the period of extended operation. The applicant stated that the Fuel Oil Chemistry Program is consistent with the 10 elements of GALL AMP XI.M30, "Fuel Oil Chemistry," after implementing two program enhancements, with two exceptions.

Section B2.1.19 Fuel Oil Chemistry, of the LRA identifies two exceptions to the program elements in GALL AMP XI.M30, "Fuel Oil Chemistry." The acceptability of these exceptions is evaluated as follows.

Exception 1. In Exception No. 1, the applicant took an exception to the recommendation in the "preventive actions" program element in GALL AMP XI.M30 to perform periodic sampling, draining, and cleaning of diesel fuel oil tanks and to add corrosion inhibitors and/or biocide agents to the diesel fuel oil inventories. The applicant stated in LRA B2.1.19 that preventive actions such as periodic fuel oil sampling, and draining and cleaning of all fuel oil tanks are not performed, and additives are not added to fuel oil.

The staff noted that there are, in fact, three exceptions to GALL AMP XI.30 "preventive actions" element as follows:

(1) Periodic fuel oil sampling of specific fuel oil tanks (day tanks and leakage collection tanks) will not be performed. The staff noted that the applicant relies on the high turnover of fuel in these tanks to preclude the need for periodic sampling because the tanks that supply fuel oil to these tanks, is sampled on a periodic basis. However, MIC could be active in these tanks because the source of the oil is not monitored for biological activity. The staff noted that the applicant relies on OE of the supply tanks, where no general, pitting and crevice corrosion and MIC

has not been observed, to justify not sampling all fuel oil tanks. The staff does not consider OE alone justification for not sampling the oil of these tanks particularly because these tanks will not receive visual inspection or UT examination of tank bottoms. Additional actions and/or evaluations are necessary to justify not sampling the oil of these tanks.

(2) GALL AMP XI.M30 recommends, in the “detection of aging effects” element, periodic cleaning and visual examination of fuel oil tanks. GALL AMP XI.M30 also recommends ultrasonic thickness measurement for locations where contaminants can accumulate such as tank bottoms in the “detection of aging” element to ensure significant degradation is not occurring. In its review of LRA B2.1.19 and the associated basis document, the staff noted that the applicant’s basis document did not clearly identify whether a particular diesel fuel oil tank would be subjected to UT of its tank bottom if the tank was not subject to a cleaning and a visual examination of the exposed, cleaned tank surfaces. The staff also noted that the basis document did clearly identify the extent of UT examination would be in regard to the grid size for the examinations. By letter dated December 5, 2008, the staff issued RAI B2.1.19-3 asking the applicant to provide the results of all diesel fuel tank cleaning and inspection to identify which fuel tanks will be subjected to ultrasonic testing (UT) of the tank bottom the extent of UT of tank bottoms, and provide a list of specific fuel tanks (if any) that will not be subjected to periodic cleaning and visual inspection or UT. In addition, the staff asked the applicant to provide a justification for not verifying that loss of material is occurring in fuel tanks that are not subjected to cleaning and visual inspection or UT.

(3) By letter dated December 18, 2008, the applicant responded to RAI B2.1.19-3 stating that PINGP fuel oil tanks have been subjected to cleaning and visual inspection on tank interiors and UT examination of tank bottoms with no corrosion identified. The applicant further stated that as a part of the One-Time Inspection Program, prior to the period of extended operation, one vaulted fuel oil storage tank bottom for the Unit 2 emergency diesel generators will be subjected to external UT. The staff noted that these tanks have not been subjected to internal cleaning and visual inspection. The applicant stated that one of the Unit 1 emergency diesel generator underground storage tanks and the diesel-driven cooling water pump fuel storage tank will be subject to cleaning, interior visual inspection, and internal UT of the tank bottoms. The applicant stated that results of future inspections will be compared with previous results and any evidence of corrosion will be enter into the Corrective Action Program to identify actions including additional tank inspections.

Based on the information supplied by the applicant related to exceptions to the GALL AMP XI.M30 and responses to RAIs, the staff finds that not verifying all tank bottom thicknesses (i.e. day tanks and leakage collection tanks) unacceptable because 1) these tanks are 1) not subject to subject to periodic sampling, 2) not cleaned and subjected to visual examinations and 3) not subjected to a UT of the tank bottoms to verify that corrosion induced loss of materials is not occurring in the tanks. Absence of an aging effect to date does not justify not performing sampling, cleaning and inspection of these tanks for wall thinning. The purity of diesel fuel inventories added to the tanks may vary from batch to batch. The staff considered this an issue because tanks selected for the one-time inspection at each unit would not necessarily be indicative of the fuel oil conditions in the remaining un-inspected fuel oil tanks for the units. During a conference call on March 30, 2009 between the staff and the applicant, the staff expressed concern that loss of material could be occurring in tanks (i. e. day tanks and leakage collection tanks) that do not receive any monitoring, preventive, or confirmatory actions and therefore, degradation would not be detected.

In a letter dated April 6, 2009 the applicant stated that one-time inspections using ultrasonic thickness measurements will be performed on selected day tanks and clean fuel oil leakage collection tanks prior to the period of extended operation as part of the One-Time Inspection Program where specific locations to be selected include: an external UT on select bottom locations on four of the seven diesel fuel oil day tanks, and an external UT on select bottom locations of one of the two D1/D2 clean fuel oil leakage collection tanks.

The staff finds that one-time UT inspection of diesel fuel oil day tanks and clean fuel oil leakage collection tanks sufficient to detect loss of material of tank bottoms because any wall thinning in these tanks would trigger additional actions such as expansion of tank bottom inspections, tank repair/replacement, tank cleaning, increased monitoring as determined through the applicant’s corrective action program. Therefore, the staff finds that not monitoring fuel oil day tanks and fuel oil leakage collection tanks for particulate, sediment and biological activity and not cleaning and internally inspecting these tanks acceptable because degradation of tank bottoms resulting from contaminated fuel oil will be detected and corrective actions will be implemented.

The staff reviewed the exception that periodic draining and cleaning of specific fuel oil tanks (day tanks and leakage, collection tanks) will not be performed. The staff noted that the applicant relies on the lack of degradation of other fuel oil tanks and fuel oil quality trends as justification for not periodically draining and cleaning these tanks. The staff does not consider OE alone justification for not draining and cleaning these tanks..

The staff reviewed the exception that biocides and/or corrosion inhibitors will not be added to fuel oil. The staff noted that the applicant relies on the lack of degradation and fuel oil quality trends as justification for not using biocides and corrosion inhibitors. The staff does not consider OE alone justification for not using biocides or corrosion inhibitors particularly for those tanks that will not receive periodic cleaning and interior visual inspection or UT examination of tank bottoms. Additional actions and/or evaluations are necessary to justify not using biocides and/or corrosion inhibitors.

GALL AMP XI.M30 recommends in the “monitoring and trending” element to monitor and trend biological activity at least quarterly. In its review of LRA B2.1.19 and the associated basis document, the staff noted that the applicant does not state whether fuel oil is tested for biological activity. By letter dated December 5, 2008, the staff issued RAI B2.1.19-2 asking the applicant if microbiological activity monitored in fuel oil and if so, identify the frequency of monitoring for microbiological activity. If not, why is lack of monitoring for biological activity not identified as an exception to GALL AMP XI.M30?

By letter dated December 18, 2008, the applicant responded to RAI B2.1.19-2 stating that PINGP does not monitor fuel oil for biological activity, as recommended by NUREG-1801, Program XI.M30, Element 5, Monitoring and Trending because 1) no indications of biological activities have been observed such as cloudiness, sludge, or other conditions that would indicate significant or any fuel degradation 2) fuel oil quality parameters, including water and sediment percentage, are routinely within acceptance limits with no adverse trends, 3) internal visual inspections of storage tank surfaces have identified no significant corrosion, and 4) ultrasonic testing of one tank indicated no wall thinning.

The applicant stated that the lack of monitoring for biological activity will be identified as an exception to GALL AMP XI.M30, Fuel Oil Chemistry and will amend Appendix B2.1.19, Fuel Oil Chemistry Program to identify the lack monitoring fuel oil for biological activity as an exception as follows:

> Fuel oil is not periodically monitored for biological activity. Fuel oil quality parameters, including water and sediment percentage, are routinely within acceptance limits at the various monitored locations and no adverse trends have been identified. The internal visual inspections of storage tank surfaces that have been completed have identified no significant corrosion, pitting or areas requiring repair due to aging effects, and no indications of unacceptable fuel oil chemistry control. Plant OE has not identified any problems involving water in the diesel fuel oil, particulate contamination, or biological fouling.

The staff noted that water, sediment, and particulate contamination of fuel oil could promote biological activity that causes loss of material due to MIC. The staff noted that monitoring and maintaining contamination (water and particulate) below acceptable levels in fuel oil systems and periodic cleaning of tanks are effective methods to mitigate biological activity because these contaminants promote biological activity and that these contaminants are effectively controlled through the applicant's Fuel Oil Chemistry program. The staff does not consider OE alone, such as lack of observing corrosion or routine acceptable fuel oil contamination levels, justification for not monitoring fuel oil for biological activity particularly for those tanks that will not receive periodic cleaning and interior visual inspection or UT examination of tank bottoms. The staff noted that additional actions and/or evaluations are necessary to justify not monitoring fuel oil for biological activity. In response to a telephone conference on 2/10/09 between the staff and the applicant, the applicant stated in a letter dated February 26, 2009, that the Fuel Oil Chemistry Program, B2.1.19 uses ASTM D 6217 to assess the mass quantity of particulate contamination present in fuel oil by filtration using a conservative filter pore size of 0.8 μm. The applicant further stated that biological activity would produce sludge and other by-products of metabolism, the test results for water and sediment (reported in volume percent) and particulate contamination (reported in mass per volume of fuel filtered) would identify the presence of biological activity in the fuel oil because test results would exhibit an increase if biological activity were present. The staff confirms that biological activity will be detected using a ASTM D 6217 using a filter pore size of 0.8 μm and finds that this is an acceptable alternative to direct monitoring for biological activity.

<u>Exception 2</u>. The applicant stated in LRA B2.1.19 that particulate contamination testing of fuel oil will be performed annually and not quarterly as recommended in the GALL AMP XI.30 "monitoring and trending" element, because annual testing is sufficiently frequent to verify that particulates are not forming, and the absence of previous particulate contamination during routine historical sampling and analysis justifies a relaxed sampling frequency. The staff considers that operating history alone is not justification for relaxing sampling frequency. By

letter dated December 5, 2008, the staff issued RAI B2.1.19-1 asking the applicant to provide additional justification for relaxation of sampling frequency.

By letter dated December 18, 2008, the applicant responded to RAI B2.1.19-1 stating that historical sampling and analysis provides OE that shows particulate contamination of fuel has not been a problem. However, the staff noted that testing of fuel oil for particulate contamination at PINGP has not been performed on a regular sampling frequency and testing of fuel oil for particulate contamination is an enhancement to the applicant’s Fuel Oil Chemistry (B2.1.19), which has yet to be implemented. As such, the staff noted that sufficient particulate contamination data are not available to evaluate a trend of particulate contamination such that sampling frequency could be reduced. During a conference call on March 30, 2009 between the staff and the applicant, the staff requested further information that justifies relaxation of the GALL AMP XI.M30 recommendation for quarterly sampling of fuel oil for particulate. In a letter dated April 6, 2009 the applicant stated that when fuel oil analysis limits are not met, such as for sediment content or particulate contamination, the condition is entered into the Corrective Action Program for evaluation and assignment of corrective actions where actions may include replacement of diesel fuel oil, more frequent sampling, use of fuel oil additives such as biocides, or tank draining, cleaning and inspection, depending on the significance of the issue and required actions to correct the condition. The staff finds that changes in sediment or particulate values will trigger corrective actions, which could include increased frequency of fuel oil particulate sampling if deemed necessary. The staff finds this exception to the GALL AMP XI.M30 acceptable because, unacceptable values of sediment (indicating possible high particulate content) and/or particulate content will initiate corrective action.

LRA Section B2.1.19, Fuel Oil Chemistry Program, identifies enhancements to the program. The applicant committed to the program enhancements.

<u>Enhancement 1</u>. The applicant stated that the “monitoring and trending” element will be enhanced to provide particulate contamination testing of fuel oil in the eleven fuel oil storage tanks in accordance with ASTM D 6217 on an annual basis. GALL AMP XI.M30 recommends the methods of ASTM D 6217 to determine particulate contamination levels in fuel oil. Implementation of ASTM D 6217 into the applicant’s Fuel Oil Chemistry Program will provide further assurance of fuel oil purity through the period of extended operation. This is acceptable because the implementation in accordance to ASTM D-6217 is consistent GALL AMP XI.M30 with the exception of using a yearly sampling basis, as discussed, evaluated and accepted in the staff's evaluation of Exception 2 to this AMP.

<u>Enhancement 2</u>. The applicant stated that the “monitoring and trending” element will be enhanced to implement one-time ultrasonic thickness measurements that will be performed at selected tank bottom and piping locations prior to the period of extended operation. GALL AMP XI.M30 recommends UT inspections of tank bottoms to verify loss of material is not occurring. Implementation of UT will provide further assurance that loss material is not occurring in fuel oil tanks and piping.

The staff finds that these enhancements will, when implemented, provide changes to the applicant’s Fuel Oil Chemistry Program such that it will conform more closely to GALL AMP XI.M30. As such, the staff finds that these enhancements will contribute to reasonable assurance that loss of material is not progressing through the period of extended operation.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.19. The applicant stated in LRA B2.1.19 that the Fuel Oil Chemistry Program has been effective in monitoring and controlling diesel fuel oil chemistry to mitigate aging effects based on OE. The applicant identified that:

- fuel oil quality parameters, including water and sediment percentage, being routinely within acceptance limits;
- new fuel oil, that did not meet quality standards, was not placed in service;
- the internal visual inspections of storage tank surfaces that have been performed identified no significant corrosion; and
- ultrasonic testing of one tank was performed in 1995 where no wall thinning due to corrosion was detected.

The staff noted that no excessive fuel oil contamination has been discovered during routine fuel oil sampling activities and that fuel oil contamination was effectively addressed through the applicant's Corrective Action Program. The staff also noted that visual and UT inspections of fuel oil tanks performed by the applicant confirm the effectiveness of the "preventive action" and "parameters monitored/inspected" elements of the Fuel Oil Chemistry Program, B2.1.19.

The staff confirmed, based on its review of PINGP OE reports, that the plant-specific OE did not reveal any degradation not bounded by the ability of visual and UT inspection to detect it and 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 A2.19, the applicant provided the UFSAR Supplement for the Fuel Oil Chemistry Program. The staff verified that provisions of the UFSAR Supplement are in accordance with SRP-LR, Table 3.3-2, Fuel Oil Chemistry after enhancements to the program are implemented as identified in the LRA. The staff verified Commitment No. 15 of the License Renewal Commitments that the applicant committed to the existing Fuel Oil Chemistry Program with enhancements before the period of extended operation and continued through the period of extended operation.

The staff determined that the information in the UFSAR Supplement is an adequate summary description of the program pending resolution of the open items, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Fuel Oil Chemistry Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determined that the AMP, with exceptions, is adequate to manage the aging effects. In addition, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL Report to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Summary of Technical Information in the Application. LRA Section B2.1.23 describes the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program as consistent, with enhancements with GALL AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The program utilizes periodic visual inspections to manage aging effects for structural components of cranes and hoists including the bridge, trolley, rail system, structural bolting, and lifting devices in accordance with the provisions of NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants."

Staff Evaluation. During its audit and review, the staff confirmed the applicant’s claim of consistency with the GALL Report. The staff reviewed the enhancements to determine whether the AMP, with the enhancements, is adequate to manage the aging effects for which the LRA credits it. Additionally, the staff interviewed the applicant’s technical staff and reviewed on-site documents.

The enhancements include guidance requiring components and structures subject to inspection to be clearly identified, and additional clarification of inspection procedures to include corrosion and wear where it is currently left out.

Through its onsite review and discussions with the applicant, the staff learned that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program is implemented through station procedures that are based on NRC approved guidance. Inspections are visual in nature, and are conducted on a routine basis for degradation.

Additionally, the staff found that the GALL Report, acceptance criteria program element included reference to the use of EOCI-61 as guidance for the containment polar cranes and turbine cranes. According to GALL Report recommendations, use of the specification that was applicable at the time the crane was manufactured is acceptable. The staff reviewed both the EOCI-61 specifications, and the CMAA-70 specifications as recommended in the GALL Report, as well as the licensee’s point-by-point comparison of the two specifications. The point by point comparison was previously submitted to and accepted by the NRC in 1982.

Enhancement 1. LRA Section B2.1.23 states an enhancement to the GALL Report “scope of program,” program element to include guidance in licensee procedures to clearly identify the components and structures subject to inspection. The staff finds this enhancement acceptable because when implemented, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will be consistent with the GALL AMP XI.M23 and will add assurance of adequate management of aging effects.

Enhancement 2. LRA Section B2.1.23 states an enhancement to the GALL Report "parameters monitored/inspected," program element to include guidance in licensee procedures to require inspection of crane components for corrosion and wear where it is currently omitted. The staff finds this enhancement acceptable because when implemented, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will be consistent with the GALL AMP XI.M23 and will add assurance of adequate management of aging effects.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.23. The applicant stated that "[t]he OE review showed that examples of paint damage and corrosion in load handling systems had been identified and corrected prior to loss of intended functions." The staff also reviewed the OE reports, including a sample of CRs, and interviewed the applicant's technical staff to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. A CR indicated that in 2003, a crack was discovered in the turbine building crane girder. A NDE was completed to verify the crack and the staff found that proper corrective actions were taken to address the issue.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA section A.2.23, the applicant provided the UFSAR Supplement for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. 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 applicant committed (Commitment No. 19) to implement this program prior to the period of extended operation.

Conclusion. On the basis of its audit and review of the applicant's Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program the staff determined that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report. The staff also reviewed the enhancements and confirmed that their implementation before the period of extended operation will result in the existing AMP being consistent with the GALL AMP to which it was credited. The staff concludes that the applicant demonstrated that the effects of aging will be adequately managed so that 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 concluded that it adequately describes the program, as required by 10 CFR 54.21 (d).

3.0.3.2.11 Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors

Summary of Technical Information in the Application. LRA Section B2.1.28 describes the applicant's existing Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program. The applicant stated that the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program (Nickel-Alloy Vessel Head Penetration Nozzle Program) is a condition monitoring program that implements the requirements of the NRC's First Revised Order EA-03-009, "Issue of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," dated February 20, 2004 (Order). This program manages the aging effects of cracking due to PWSCC of the nickel-alloy vessel head penetration nozzles welded to the upper reactor vessel head.

In addition, the program monitors the upper reactor vessel head surface and the region above the reactor vessel head for boric acid leakage. The upper reactor vessel heads for both Units 1 and 2 have been replaced. The new heads now incorporate Nickel-Alloy 690 (SB167) for each of the reactor head penetration nozzles instead of the Nickel-Alloy 600 utilized in the previous heads.

Staff Evaluation. During its audit, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed enhancements to determine whether the AMP, with the enhancements, is adequate to manage the aging effects for which the LRA credits it.

The staff noted that where the applicant claimed the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program to be consistent with elements of the GALL AMP XI.M11A, the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program elements are consistent with the GALL AMP XI.M11A after the enhancements are implemented.

LRA Section B2.1.28, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program, identifies four enhancements to the program, as follows:

(1) on the "detection of aging effects" program element - the program will be enhanced to require that any deviations from implementing the appropriate required inspection methods of the NRC First Revised Order EA-03-009, will be submitted for NRC review and approval;

(2) on the "monitoring and trending" program element - the program will be enhanced to require that any deviations from implementing the required inspection frequencies will be submitted for NRC review and approval;

(3) on the "acceptance criteria" program element – the program will be enhanced to require that relevant flaw indications detected as a result of implementing the augmented inspections of the upper reactor vessel closure head penetration nozzles will be evaluated in accordance with the criteria approved by the NRC; and

(4) on the “corrective actions” program element - the program will be enhanced to require that, if leakage or evidence of cracking in the upper reactor vessel closure head penetration nozzles is detected while the nozzles are ranked in the “Low,” “Moderate,” or “Replaced” susceptibility category, the nozzles are to be immediately reclassified to the “High” susceptibility category and the required augmented inspections for the “High” susceptibility category are to be implemented during the same outage the leakage or cracking is detected.

The staff finds that these enhancements will provide changes to the applicant’s Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program such that it will conform to GALL AMP XI.M11A. As such, the staff finds that these enhancements will contribute to reasonable assurance that cracking due to PWSCC will be managed such that the vessel head penetrations will perform their intended functions through the period of extended operation.

The staff noted that, in its final SOC on the updates of 10 CFR 50.55a, “codes and standards” (refer to Federal Register [FR] Volume 73, No. 176, pages 52730 – 52750), the staff mandated new augmented inspection requirements for upper reactor vessel closure head (RVCH) penetration nozzles that are made from nickel alloy materials or that are structurally welded to the upper RVCH using bimetallic (i.e., nickel alloy) weld filler metals. For these components, the updated rule imposed: (1) new augmented non-visual inspection methods for the components in accordance with the methods and criteria in ASME Code Case N-729-1, as defined, referenced and subject to the limitations in 10 CFR 50.55a(g)(6)(ii)(D), and (2) new augmented bare metal visual examinations requirements in accordance with the methods and criteria in ASME Code Case N-722, as defined, referenced and subject to the limitations in 10 CFR 50.55a(g)(6)(ii)(E). The referenced SOC makes the following statement with respect to PWR applicants whose LRAs include AMPs corresponding to GALL AMP XI.M-11A and whose LRAs are currently under review:

> For new or current license renewal applicants, they may reference conformance GALL AMP XI.M11A and compliance with the augmented inspection requirements in paragraphs 10 CFR 50.55a(g)(6)(ii)(D) and (E) without the need for taking an exception to the program elements in GALL AMP XI.M11A.

The program description in GALL AMP XI.M11-A states:

> This program is established to ensure that augmented inservice inspections (ISI) of all nickel alloy vessel head penetration (VHP) nozzles welded to the upper reactor vessel (RV) head of a PWR-designed light-water reactor will continue to be performed as mandated by the interim requirements in Order EA-03-009, “Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (PWRs),” as amended by the First Revision of the Order, or by any subsequent NRC requirements that may be established to supersede the requirements of Order EA-03-009.

Thus, the staff’s program in GALL AMP XI.M11-A accounted for the fact that the augmented inspection requirements that were established in NRC Order EA-03-009 and amended in First Revised Order EA-03-009 would eventually be superseded by augmented inspection requirements for these components in either 10 CFR 50.55a or in the ASME Code Section XI. The SOC in FR Volume 73, No. 176, pages 52730 – 52750, confirms that the finalized augmented inspection requirements have been mandated in accordance with 10 CFR 50.55a (g)(6)(ii)(D) - (E) and in the ASME Code cases referenced in these regulatory paragraphs. Thus based on this clarification and the regulatory basis in SOC in FR Volume 73, No. 176 (pages 52730 – 52750), the applicant may update the program elements for its Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program to reflect the new augmented inspection requirements for these components without having to take an exception to GALL AMP XI.M11-A.

The applicant's program includes LRA Commitment No. 22, which calls for the applicant to implement its Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program during the period of extended operation but does not include the new mandated requirements of 10 CFR 50.55a(g)(6)(ii)(D) -(E). However, the staff noted that the applicant committed in Commitment No. 1 to submit amendments to the PINGP LRA including UFSAR supplements pursuant to10 CFR 54.21(b), which requires that each year following submittal of the LRA and at least three months before scheduled completion of the NRC review, an amendment to the renewal application must be submitted that identifies any change to the CLB of the facility that materially affects the contents of the LRA, including the FSAR supplement. Based on the applicant's Commitment No. 1, the staff finds the applicant will implement the new mandated augmented inspection requirements in 10 CFR 50.55a(g)(6)(ii)(D) - (E).

The staff's cover letter for First Revised Order EA-03-009, dated February 20, 2004, states the requirements of the Order are in effect until that time when the requirements of the Order will be reflected in an appropriate update of 10 CFR 50.55a. The augmented inspection requirements for upper RVCH penetration nozzles and their welds, as provided in 10 CFR 50.55a(g)(6)(ii)(D) - (E), are the appropriate augmented inspection requirements that supersede the requirements in First Revised Order EA-03-009. When implemented, the required update of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program to include these augmented inspection requirements will eliminate the need for the enhancements of the program under LRA Commitment No. 22 because the augmented inspection requirements in 10 CFR 50.55a(g)(6)(ii)(D) and (E) for these components supersede the requirements in First Revised Order EA-03-009 for these components and because the NRC has now established appropriate regulations in 10 CFR 50.55a to ensure the non-visual non NDEs will now be performed on upper RVCH penetration nozzles and their associated nozzle-to-vessel Class 1 pressure boundary welds and that bare metal visual examinations will now be performed on the upper RVCH, and in most importantly at upper reactor closure head to penetration nozzle junctions.

<u>Operating Experience Review</u>. The applicant stated that OE for the Nickel-Alloy Vessel Head Penetration Nozzle Program identified no adverse trends or issues with program performance. A few minor non-relevant leaks from valves were identified and corrected prior to causing any significant impact to safe operation or loss of intended functions. Adequate corrective actions were taken to prevent recurrence.

Operating experience on cracking of upper RVCH penetration nozzles is adequately addressed in NRC Order EA-03-009 and in First Revised Order EA-03-009. The requirements in the orders (prior to the time that they were superseded by the updated augmented requirements for these components in 10 CFR 50.55a(g)(6)(ii)(D) and (E)) were imposed to address the generic OE for upper RVCH penetration nozzles that are fabricated from nickel alloy base metals or that are welded to the upper RVCHs using nickel alloy weld materials. The orders established that replacement of the upper RVCHs is a viable corrective action activity to address the generic OE for these components.

The staff audited the applicant's OE reports and interviewed the applicant's technical staff. The staff noted that the documentation provided by the applicant during the onsite review support the applicant's statements regarding OE and confirmed that the plant-specific OE did not reveal any degradation not bounded by industry experience.

The staff noted that the applicant did not identify any leakage of the borated reactor coolant due to cracking in the upper RVCH penetration nozzles or their nickel alloy nozzle-to-RVCH J-groove welds. The staff also noted that the applicant replaced both RVCHs with RVCHs that have Alloy 690 nickel alloy penetration nozzles and Alloy 52/152 nickel alloy nozzle-to-RVCH welds. Thus, the staff concludes that the applicant has addressed the generic OE for its upper RVCH penetration nozzles because the applicant has replaced the upper RVCHs for the PINGP units and because the applicant will now follow the current augmented inspection requirements for the replacement upper RVCHs and penetration nozzles, as mandated in 10 CFR 50.55a (g)(6)(ii)(D) - (E) and in the ASME code cases as referenced in and subject to the limitations of these regulatory paragraphs.

Thus, based on this review, 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 Review. The applicant provided its UFSAR Supplement for the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program in PINGP LRA, Appendix A, Section A2.28. The staff verified that provisions of the UFSAR Supplement are in accordance with SRP-LR (NUREG-1800, Revision 1), Table 3.1-2, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program.

The staff verified that in Commitment No. 22, the applicant committed to the existing Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program with enhancements through the period of extended operation.

However, new augmented inspection requirements for the upper RVCH penetration nozzles that are mandated in 10 CFR 50.55a (g)(6)(ii)(D) - (E) and in the ASME Code Cases N-722 and N-729 which are referenced in and subject to the limitations of these regulatory paragraphs.

The staff noted that in the applicant's Commitment No. 1, the applicant submitted changes to the LRA that are needed based on changes to the CLB that affect the contents of the LRA, including UFSAR Supplements summary sections for the LRA. Thus, the staff also noted that the scope of the commitment includes the need to update the program elements of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program, as implemented through the implementation of the applicant's, ASME

Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program in order to incorporate the new augmented inspection requirements for upper reactor vessel closure head penetration nozzles that were mandated in 10 CFR 50.55a(g)(6)(ii)(D) - (E. The staff finds this to be is acceptable because it is in compliance with the requirements 10 CFR 54.21(b) and because the applicant will be required to update the program elements for this AMP to incorporate these new augmented inspection requirements for nickel alloy components at the next LRA update required by 10 CFR 54.21(b).

Based on this review, the staff finds that the applicant's UFSAR Supplement for this AMP is acceptable because it is in conformance with the recommended UFSAR Supplement summary description for these types of programs in Table 3.1-2 of the SRP-LR and because the applicant will update the UFSAR Supplement following the augmented inspection requirements for these components in 10 CFR 50.55a (g)(6)(ii)(D) - (E) and in the ASME code cases that are referenced in and subject to the limitations of these regulatory paragraphs.

The staff finds that the UFSAR Supplement for the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program 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 Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program, the staff finds all program elements are consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and 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 Head Closure Studs

Summary of Technical Information in the Application. LRA Section B2.1.33 describes the Reactor Head Closure Studs program as consistent, with an enhancement to the GALL AMP XI.M3, "Reactor Head Closure Studs." The program manages the effects of aging for reactor head closure studs and stud components through the implementation of plant procedures following the examination and inspection requirements of ASME Section XI Table, IWB-2500-1, and the guidance provided in NRC Regulatory Guide 1.65, "Materials and Inspection for Reactor Vessel Closure Studs." AERM include cracking due to SCC, and loss of material due to wear, general, pitting and crevice corrosion.

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 the LRA credits it. 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 AMP and compared the elements in the applicant's program with the GALL AMP XI.M3 program elements.

The staff compared the elements in the applicant's program with the GALL Report program elements. The applicant confirmed that it conforms to the requirements of the ASME Code, Section XI, Subsection IWB 1998 edition including the 1998, 1999, and 2000 Addenda for the current ISI interval, and not the 2001 edition as recommended by GALL Report. The staff noted that the applicant discusses its basis for crediting the ASME Code Section XI edition in LRA AMP B2.1.3, ASME Section XI Inservice Inspection, Subsection IWB, IWC, and IWD Program. The staff evaluates AMP B2.1.3 in SER Section 3.0.3.1.3.

Enhancement 1. LRA Section B2.1.33 states an enhancement to the GALL Report "corrective actions," program elements to include controls to be implemented prior to August 9, 2013, for Unit 1, and October 29, 2014, for Unit 2 which "ensure that future procurement of reactor head closure studs will be in accordance with the material and inspection guidance provided in NRC Regulatory Guide 1.65." The staff confirmed with the applicant that current reactor head closure studs are already in accordance with NRC RG 1.65, and the applicant further explained that though they are aware of, and currently conform to the specifications in NRC RG 1.65, no controls currently exist at PINGP that would prevent non-conformance. The staff finds this enhancement acceptable because when implemented, the Reactor Head Closure Studs Program will be consistent with GALL AMP XI.M3 and will add assurance of adequate management of corrective actions.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.33. The applicant stated that the program is effective in the management of age-related degradation associated with reactor head closure studs, as well as the detection of closure bolting leakage associated with reactor head closure studs. The staff reviewed the OE reports to confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. The reports indicated that two undesirable indications have been recorded on the reactor head closure studs at the PINGP site. These conditions were minor in severity, and were corrected through its corrective action program. PINGP did not identify any adverse trend in program performance. PINGP also reviews industry OE and completes periodic self assessments to evaluate its own program effectiveness.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA section A.2.33, the applicant provided the UFSAR Supplement for the Reactor Head Closure Studs 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, in LRA Commitment No. 26, the applicant committed to implementing the enhancements to the program as described in LRA Section B2.1.33 prior to the period of extended operation.

<u>Conclusion</u>. On the basis of its review of the applicant's Reactor Head Closure Studs Program as discussed above, the staff determined that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report. The staff has reviewed the information provided in Section B2.1.33 of the LRA Appendix B. In addition, the staff reviewed the enhancement and its associated justifications and determined that the AMP, with the enhancement, is adequate to manage the aging effects for which it is credited and confirmed that its implementation before the period of extended operation will result in the existing AMP being consistent with the GALL AMP to which it was credited. The staff concluded that the applicant has demonstrated that effects of aging on the reactor head closure studs and nuts constructed from materials with a maximum tensile strength limited to less than 170 ksi 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 adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Reactor Vessel Surveillance Program

In Appendix B of the LRA, the applicant indicated that it will implement AMP B2.1.34, "Reactor Vessel Surveillance Program," for monitoring neutron embrittlement of the reactor vessel (RV) beltline materials at the PINGP, Units 1 and 2. This AMP is consistent with the GALL Report with enhancements. The staff reviewed the attributes of the applicable enhancements and the results of the review are documented in the following sections.

<u>Summary of Technical Information in the Application</u>. LRA Section B2.1.34 describes the existing RV Surveillance Program (RVSP) as consistent, with enhancements, with GALL AMP XI.M31, "RV Surveillance." The applicant's RVSP manages the reduction of fracture toughness of the RV beltline materials due to neutron embrittlement to fulfill the intent and scope of Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements." The program ensures compliance with the requirements that are specified in 10 CFR 50.60 for fracture prevention and 10 CFR 50.61 for Pressurized Thermal Shock (PTS). The applicant's RVSP includes radiation analysis, mechanical testing of the surveillance capsules, development of pressure-temperature (P-T) operating limits, and determination of low-temperature overpressure protection. The applicant stated that consistent with plant technical specifications, the P-T limits report, and 10 CFR 50.60 and 10 CFR Part 50, Appendix H, the RVSP will update the operating P-T limits and will manage surveillance capsule withdrawal schedules.

The applicant stated that it implemented enhancements to the GALL AMP XI.M31 for the extended period of operation in which the following requirements will be added to its RVSP:

(1) all withdrawn and tested surveillance capsules, not discarded as of August 31, 2000, are placed in storage for possible future re-constitution and use, and

(2) if spare capsules are withdrawn, the untested capsules are placed in storage and maintained for future insertion.

The program manages the steps taken (e.g., the review and updating of 60-year fluence projections to support the preparation of new P-T limit curves and pressurized thermal shock reference temperature calculations) for altered RV exposure conditions.

Staff Evaluation. The staff reviewed the applicant's proposed enhancements to the GALL Report requirements to determine whether the AMP, with the enhancements, remains adequate to manage the aging effects for which it is credited. The RVSP, which is designed and implemented in accordance with 10 CFR Part 50, Appendix H, uses testing of the RV surveillance capsule test specimens as the basis for monitoring for neutron irradiation-induced embrittlement in base metals (plate or forgings) and welds that are located in the beltline region of the low alloy steel RV.

Units 1 and 2 RVSP consists of six surveillance capsules for each unit and each capsule contains mechanical test specimens, Charpy V-Notch specimens, neutron dosimetry, and thermal monitors. Fracture toughness of beltline materials is indirectly monitored through measurement of the impact energy of Charpy V-Notch specimens. The applicant has tested four of the six surveillance capsules in each unit to date, and the latest capsules of PINGP, Units 1 and 2 were tested at projected fluence values, which are less than 60 year fluence. Section 6.0 of AMP XI.M31 in NUREG-1801, "Generic Aging Lessons Learned Report," Volume 2, Revision 1, states that if an applicant has a surveillance program that consists of capsules with a projected fluence of less than the projected 60 year fluence at the end of 40 years, at least one capsule is to remain in the RV and to be tested during the extended period of operation. To ensure that the applicant complies with the aforementioned GALL Report requirement, in RAI B2.1.34 (A), by letter dated November 4, 2008, the staff requested that the applicant confirm whether one of the two remaining capsules in each unit will be tested during the extended period of operation. Furthermore, the staff requested that the applicant provide the following relevant information regarding the testing of the capsules in Units 1 and 2.

(1) Applicant's plan to test an additional surveillance capsule from each unit,
(2) the projected refueling outages of withdrawal for each unit, and
(3) projected neutron fluence value for each capsule at the time of withdrawal.

In response to the staff's RAI, in a letter dated November 13, 2008, the applicant stated that one of the two remaining capsules in each unit will be withdrawn after the capsules have received a neutron fluence equivalent to the 54 effective full power years (EFPY). The applicant did provide the projected maximum RV fluence values that represent the fluence values for 54 EFPY at the time of withdrawal of the surveillance capsules from Units 1 and 2. The Unit 1 surveillance capsule is planned for withdrawal during the re-fueling outage 1R27 which is expected to occur in 2011, and the Unit 2 surveillance capsule is planned for withdrawal during the re-fueling outage 2R27 which is expected to occur in 2012. The staff finds the applicant's response acceptable because it complies with the GALL Report requirement and it provides adequate assurance that the applicant intends to monitor the neutron embrittlement of the RV during the extended period of operation.

In RAI B.2.1.34 (B), in a letter dated November 4, 2008, the staff requested that the applicant confirm that the withdrawal schedule of the capsules to be used for future tests during the extended period of operation is consistent with the requirements specified in paragraph 7.6.2 of the American Society of Testing Materials (ASTM) E 185, 1982 Edition, "Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels."

In response to the staff's RAI B.2.1.34 (B), in a letter dated November 13, 2008, the applicant confirmed that consistent with the requirements specified in ASTM E 185, 1982 Edition, it will withdraw the surveillance capsules from Units 1 and 2 during the license renewal period when their exposure exceeds the peak neutron fluence value at 54 EFPY but does not exceed twice this peak neutron fluence value. The staff accepts this response as it is consistent with the requirements specified in ASTM E 185, 1982 Edition.

In RAI B.2.1.34 (C), by letter dated November 4, 2008, the staff requested that the applicant confirm that untested surveillance capsules (standby capsules) will be stored for future use at Units 1 and 2. In response to the staff's RAI B.2.1.34 (C), by a letter dated November 13, 2008, the applicant stated that consistent with its Commitment No. 27, it will add a requirement to AMP B2.1.34 indicating that the untested standby capsules will be placed in storage and maintained for future insertion at PINGP.

The staff finds this response acceptable because future capsule testing will provide reasonable assurance that neutron irradiation-induced embrittlement in the RV beltline materials as a result of any change in projected neutron fluence can be monitored effectively during the extended period of operation. The staff determined that the aforementioned applicant's response will be included in the staff's safety evaluation as a part of a standard license condition.

After reviewing the applicant's response to the staff's RAI B.2.1.34(A), (B) and (C), the staff concludes that its concern described in RAI B.2.1.34 is resolved.

The staff accepts the applicant's RVSP based on the following reasons:

- the testing of the surveillance capsules in accordance with the proposed schedule provides reasonable assurance that the neutron-induced embrittlement in low alloy steel RV base metals and their associated welds will be adequately monitored during the extended period of operation and,
- the applicant's RVSP complies with the requirements of the 10 CFR Part 50, Appendix H.

The staff confirmed that the applicant's discussion of the OE program element satisfies the criteria defined in the GALL Report and in Section A.1.2.3.10 of the "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." The staff finds this program element acceptable.

Operating Experience. The applicant stated that the RVSP has been effectively used to monitor the RV material aging effects due to neutron embrittlement. Based on the projected neutron fluence for the extended period of operation [i.e., 54 effective full power years (EFPY)], the applicant claimed that the RV beltline materials will maintain projected upper-shelf energy values exceeding the minimum required value of 50 ft-lb. The PTS reference temperatures for the beltline materials are projected to be below the screening criteria of 270 ºF for longitudinal welds, plates and forgings and 300 ºF for circumferential welds at 54 EFPY.

UFSAR Supplement. In LRA Section A.2.34, the applicant provided the UFSAR supplement for the RVSP. The staff reviewed this section and determined that the information in the 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 RVSP, 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 prior to and/or during the period of extended operation would support the requirements of the GALL AMP. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 RG 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants

Summary of Technical Information in the Application. LRA Section B2.1.35 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 manages aging effects in water-control SCs, including bolting, through periodic visual inspections and hydrographic surveys. The applicant also stated that the program considers the guidance in RG 1.127 and ACI 349.3R-96 if it is necessary to evaluate degradation mechanisms and questionable concrete conditions.

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 in Commitment No. 28 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 PINGP AMP B2.1.35 "RG 1.127 Water-Control Structures Inspection," which provides an assessment of the AMP elements' consistency with the 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 the GALL AMP XI.S7.

Enhancement 1. LRA Section B2.1.35 states an enhancement to the "scope of program" element to add inspections of concrete and steel components that are below the water line at the Screenhouse and Intake Canal. The applicant also states that the scope will be enhanced to require inspections of the Approach Canal, Intake Canal, Emergency Cooling Water Intake, and Screenhouse immediately following extreme environmental conditions or natural phenomena including an earthquake, flood, tornado, severe thunderstorm, or high winds.

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 program will be enhanced to ensure consistency with the scope identified in GALL AMP XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants." This AMP consists of PINGP activities that manage aging effects for components of the following systems and/or structures:

- Approach Canal (APC);
- Component Supports (HGR);
- Emergency Cooling Water Intake (ECI);
- Intake Canal (INC); and
- Screenhouse (SCH)

The staff found this enhancement acceptable because enhancement to PINGP AMP B2.1.35, "RG 1.127 Water-Control Structures Inspection," is consistent with the GALL AMP XI.S7 and provides additional assurance that the effects of aging will be adequately managed.

Enhancement 2. LRA Section B2.1.35 states an enhancement to the "parameters monitored or inspected" program element to include an inspection of water-control concrete components that are below the water line for cavitation and erosion degradation. The applicant also states that the program will also be enhanced to visually inspect for damage such as cracking, settlement, movement, broken bolted and welded connections, buckling, and other degraded conditions following extreme environmental conditions or natural phenomena.

The staff reviewed the applicant's RG 1.127 Water-Control Structures Inspection Revision 1 Section C.2 requirements, and their AERMs under the parameters monitored or inspected program elements. The staff noted that the program parameters to be inspected will be revised to include a visual inspection for cavitation and erosion damage of water-control concrete components that are below the water line. Enhanced parameters are consistent with those provided in NRC RG 1.127, Section C.2. The program will also be enhanced to visually inspect structural components for damage such as cracking, settlement, movement, broken bolted and welded connections, buckling, and other degraded conditions immediately following extreme environmental conditions or natural phenomena including earthquake, flood, tornado, severe thunderstorm, or high winds. These parameters are consistent with those provided in NRC RG 1.127, Section C.2.

The staff found this enhancement acceptable because the enhancement to PINGP AMP B2.1.35, "RG 1.127 Water-Control Structures Inspection," is consistent with the GALL AMP XI.S7 and provides additional assurance that the effects of aging will be adequately managed.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.35, 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. During its audit and review, the staff noticed some minor degradation of items such as gasket materials, grout and bolting. The applicant stated that in 1997, minor calcium deposits, concrete spalling and minor wall cracks were observed in the Screenhouse. The spalling was repaired and the calcium deposit and cracks were determined to be non-active and did not affect the structural integrity of any of the structures reviewed. The staff also noted that water-control structures are periodically inspected at least once every five years consistent with industry guidance provided in ACI 349.3R-96 and Section C.4 of NRC RG 1.127. The program contains provisions to increase the inspection frequency as one of many considerations when evaluating the cause of a degraded condition in accordance with the corrective action program.

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 water control structures and that existing program OE revealed no degradation not bounded by industry experience. The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A2.35, 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 its 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. 28 prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Selective Leaching of Materials Program

Summary of Technical Information in the Application. LRA Section B2.1.36 describes the new Selective Leaching of Materials Program as consistent, with an exception, with GALL AMP XI.M33, "Selective Leaching of Materials." The applicant stated that the program performs a one-time visual inspection of selected components made of cast iron, copper alloys greater than 15 percent zinc, and copper-nickel. The applicant also stated that the program requires a hardness measurement or other suitable detection technique. The applicant stated that through inspections of representative samples, the program will determine if selective leaching is occurring and, if found, whether the aging mechanism will affect the ability of the component to perform its intended function.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the 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.M33, 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 the GALL AMP XI.M33. The staff also confirmed that the plant program contains all of the elements of the referenced the GALL AMP. On-site interviews with the applicant's staff were also held to confirm these results.

Exception 1. LRA Section B2.1.36 states an exception to the "scope of program," "parameters monitored/inspected," and "detection of aging effects" program elements. The applicant stated that alternate detection techniques may be used instead of, or in addition to visual inspections and hardness testing. The applicant noted that visual inspection and hardness measurement may not be feasible due to component configuration and location. In addition, other available detection techniques such as mechanical scraping or chipping, and additional examination methods that become available may be shown to be as effective as visual inspection and hardness testing in detecting and assessing the extent of selective leaching.
The staff reviewed the exception, which involves the use of examinations other than Brinell hardness testing identified in the GALL Report, to identify the presence of selective leaching. The staff issued RAI B2.1.36-1 by letter dated November 5, 2008 and requested that the applicant provide additional information concerning alternative detection techniques and justification for the use of these techniques.

In its response dated December 5, 2008, the applicant stated that the inspections specified in the GALL Report may not be feasible due to component form, configuration, and location. The applicant explained graphitization, which results from dissolving iron in gray cast iron components, and how it can weaken components by creating graphite, voids, and rust. The applicant also explained dezincification, which results from dissolving zinc in a liquid solution, and how it can weaken copper alloys (>15% zinc).

The applicant stated that a combination of visual inspections in conjunction with mechanical methods will result in the detection of selective leaching, if present. The applicant stated that it would perform followup inspections if these methods detect dezincification or graphitization. The applicant also stated that it would enter the identification of selective leaching into the Corrective Action Program for evaluation to determine acceptability of the affected components for further service, and assessment of required corrective actions.

The staff determined that the exception is justified, because (1) Brinell hardness testing may not be feasible for most components due to form and configuration (i.e., heat exchanger tubes) and (2) other mechanical means, i.e., scraping or chipping, provide an equally valid method of identification. The staff determined that the commitment to perform follow-up inspections and entering identified selective leaching into the Corrective Action Programs provides assurance that potential selective leaching is identified and managed. The staff recognizes that the industry is evaluating additional examination methods that become available for detecting and assessing the extent of the selective leaching mechanism.

The staff determined that the proposed alternate inspection methods are valid alternatives for identifying material aging. In addition, the use of different inspection techniques increases the likelihood of identifying aging in the various components within the Selective Leaching of Materials Program. The staff finds this exception acceptable because the additional qualitative mechanistic techniques can detect selective leaching and are in addition to visual inspections as recommended by the GALL Report.

Based on its review of the exception and resolution of the RAI as described above, the staff finds the Selective Leaching of Materials Program consistent with the program elements of the GALL AMP XI.M33, with acceptable exception, and therefore acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.36. The applicant stated that the Selective Leaching of Materials Program is a new program and has no OE related to the program implementation. The applicant stated that its search of plant OE did not reveal any instances of selective leaching having been documented at PINGP in the past. However, the applicant plans to use available plant and industry OE to establish sample size, inspection location, and inspection techniques.

During the audit, the staff interviewed the applicant's technical staff concerning industry OE. The applicant was aware of the difficulty in performing Brinell hardness testing on certain components and was knowledgeable of other detection techniques being evaluated by the industry.

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 A2.36, the applicant provided the UFSAR supplement for the Selective Leaching of Materials Program. The staff verified that the UFSAR supplement summary description for the Selective Leaching of Materials Program was in conformance with the staff's recommended UFSAR supplement for these types of programs provided in Table 3.3-2 of the SRP-LR.

In its letter dated April 13. 2009, the applicant provided a list of license renewal commitments. The staff verified that the applicant has included in the final license renewal commitment list, Commitment No. 29, that the Selective Leaching of Materials Program will be implemented prior to the period of extended operation.

Based on this review, the staff determines that UFSAR supplement Section A2.36 provides an acceptable UFSAR supplement summary description of the applicant's Selective Leaching of Materials Program because it is consistent with those UFSAR supplement summary description in the SRP-LR for Selective Leaching of Materials Program. The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Selective Leaching of Materials Program, and the applicant's response to the staff's RAI, 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 determined 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).

3.0.3.2.16 Steam Generator Tube Integrity

Summary of Technical Information in the Application. LRA Section B2.1.37 describes the existing Steam Generator Tube Integrity Program as consistent, with one exception, with the GALL AMP XI.M19, “Steam Generator Tube Integrity.” The applicant stated that the AMP consists of activities that manage the aging effects of cracking, denting, ligament cracking, and loss of material for steam generator tubes, tube plugs, tube repairs, and various secondary side internal components.

The applicant stated that the Steam Generator Tube Integrity Program is implemented in accordance with Technical Specifications Section 5.5.8 and applicable industry guidance to maintain the integrity of the program. The applicant stated that it follows the guidelines contained in the latest revision of EPRI TR-107569-V1R5, “PWR Steam Generator Examinations and Guidelines,” which provide criteria for the qualification of personnel, specific techniques, and the associated acquisition and analysis of data, including procedures, probe selection, analysis protocols, and reporting criteria.

The applicant further stated that the Steam Generator Tube Integrity Program also incorporates the guidance of NEI 97-06, “Steam Generator Program Guidance,” for performance criteria, which pertain to structural integrity accident-induced leakage, and operational leakage. The program also includes guidance on assessment of degradation mechanisms, inspection, tube integrity assessment, maintenance, plugging, repair, and leakage monitoring, as well as procedures for monitoring and controlling secondary side and primary side water chemistry.

In response to Generic Letter 97-06, the applicant outlined the program, which is in place, to detect degradation of steam generator internals. The applicant stated that its Steam Generator Tube Integrity Program demonstrated that the steam generator internals were in compliance with the plant’s CLB.

Staff Evaluation. During its audit, 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’s summary of its on-site review of AMP B2.1.37, Steam Generator Tube Integrity Program, is documented in staff’s Audit Summary Report Section for this AMP.

During its audit, the staff verified that the applicant’s Steam Generator Tube Integrity Program elements for “scope of program,” “preventive actions,” “parameters monitored/inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “operating experience” were consistent with the corresponding program elements of the GALL AMP XI.M19. The staff’s review of the program elements for “corrective actions,” “administrative controls,” and “confirmatory controls” program elements of this AMP were reviewed as part of the staff’s review of the Quality Assurance Program for the LRA. On-site interviews were also held to confirm these results.

Exception. LRA Section B2.1.37 states an exception to the “scope of program” program element in that the applicant’s Steam Generator Tube Integrity Program references NEI 97-06, “Steam Generator Program Guidance,” Revision 2, whereas the GALL AMP XI.M33 references NEI 97-06, Revision 1. In discussions with the staff, the applicant stated that NEI 97-06, Revision 2, incorporates the latest industry OE, which strengthens the intent of NEI 97-06 to establish a framework for structuring and enhancing existing steam generator tube inspection programs.

On October 3, 2005, the staff sent a letter to NEI concerning NEI 97-06, “Steam Generator Program Guidelines,” Revision 2. The staff stated that NEI 97-06, Revision 2, is consistent with Technical Specification Task Force Traveler (TSTF) 449, Revision 4, “Steam Generator Tube Integrity.” The staff approved TSTF 449, Revision 4, in May 2005 and published the Traveler in the Federal Register on May 6, 2005.

In the letter dated October 3, 2005, the staff stated the following:

> As you know, TSF 449 and NEI 97-06 are performance based. As a result, we will continue to monitor steam generator performance at each plant consistent with our review and oversight processes. If we identify any issues with NEI 97-06 or the associated Electric Power Research Institute (EPRI) guidelines as a result of these activities, we will notify you or your staff so that you can evaluate the need to update your guidance documents.

The GALL AMP XI.M19 states that a licensee’s plant Technical Specifications, its response to GL 97-06, and its commitment to implement the steam generator degradation management program described in NEI 97-06 are adequate to manage the effects of aging on the steam generator tubes, plugs, sleeves, and tube supports.

The staff issued Revision 1 of the GALL Report in September 2005. In the program description, the staff does not identify the revision number for NEI 97-06. However, the GALL AMP XI.M19 reference section identifies NEI 97-06, Revision 1. The staff determined that NEI 97-06, Revision 2, was issued after the GALL Report, Revision 1, was issued. Consequently, NEI 97-06, Revision 2, was not included in the GALL AMP XI.M19 reference section.

The staff determined that NEI 97-06, Revision 2, summarizes the changes from NEI 97-06, Revision 1, and incorporates additional industry OE. The staff finds that the use of NEI 97-06, Revision 2 is acceptable until notified by the NRC.

The staff has reviewed and approved TSTF 449, Revision 4. The staff determined that the applicant has amended its Technical Specifications in accordance with TSTF 449, Revision 4. The staff found that the applicant has incorporated the guidance in NEI 97-06, Revision 2, which includes the latest industry OE. The staff has yet to identify any issues associated with NEI 97-06, Revision 2.

On the basis of its review, the staff concludes the use of NEI 97-06, Revision 2, is consistent with GALL AMP XI.M19, and finds the exception acceptable.

Based on its review of the exception, the staff finds the Steam Generator Tube Integrity Program consistent with program elements of the GALL AMP XI.M19, with acceptable exception, and therefore acceptable.

Operating Experience. The staff reviewed the OE described in LRA Section B2.1.37. The applicant stated that a review of OE related to the Steam Generator Tube Integrity Program indicates the program has been effective in ensuring the timely detection and correction of steam generator aging effects. The applicant also stated that the program utilizes OE to promote the identification and transfer of lessons learned from both internal and industry events so that the knowledge gained can be used to improve nuclear safety and operations.

In LRA Section B2.1.37, the applicant states that the AMP has evolved to include improvements in programmatic features. The applicant stated that it has evaluated the existing AMP against NEI 97-06, Revision 2, and, where necessary, revised and strengthened the program attributes to meet the intent of the guidance. The applicant stated that the industry has strengthened their Steam Generator Tube Integrity Programs with aggressive improvements in control of secondary side water chemistry and upgrades in secondary side equipment, thus essentially eliminating both wastage and denting.

In LRA Section B2.1.37, the applicant stated that in accordance with NEI 97-06, Revision 2, it conducts condition monitoring assessments to confirm adequate tube integrity has been maintained, outage inspections to confirm that the performance criteria are being met, and operational assessments to confirm that adequate tube integrity will be maintained for the operating interval between inspections. The applicant stated that if the operational assessment does not bound the latest condition monitoring results, then corrective action will be initiated.

The staff reviewed and approved TSTF 449, Revision 4, “Steam Generator Tube Integrity,” in May 2005. As part of the program requirements, the applicant is required to provide the staff with information concerning condition monitoring assessments, outage inspections, and operational assessments after every refueling outage. The staff reviewed this information and determined that it is acceptable. The staff audited A/R No. 00888189, “Action Request Report;” L-HU-06-026, “Supplement to Application for Technical Specification Improvement Regarding Steam Generator Tube Integrity; and the applicant’s response to Generic Letter 97-06, “Steam Generator Internals Degradation,” and determined that the applicant has complied with the Steam Generator Tube Integrity Program requirements.

The GALL Report states that implementation of the Steam Generator Tube Integrity Program provides reasonable assurance that steam generator tube integrity is maintained consistent with the plants’ licensing basis for the period of extended operation. Experience with the condition monitoring and operational assessments required for plants that have implemented the alternate repair criteria in NRC GL 95-05 has shown that the predictions of the operational assessments have generally been consistent with the results of the subsequent condition monitoring assessments.

The staff reviewed the applicant’s OE associated with the Steam Generator Tube Integrity Program. The staff audited OE and selected reports and letters. The staff interviewed the applicant’s technical staff to confirm that plant-specific OE did not reveal any degradation outside the bounds of industry experience. The staff noted that the applicant has operated its steam generators for over 30 years before replacement was required. The staff determined that the applicant’s steam generator tube inspection programs have been effective.

On these bases, the staff concluded that the applicant’s Steam Generator Tube Integrity Program has been effective in managing steam generator tube integrity aging effects and that the program will be managed adequately so that the structure and component intended functions will be maintained during the period of extended operations.

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 A2.37, the applicant provided the UFSAR supplement for the Steam Generator Tube Integrity Program. The staff verified that the UFSAR supplement summary description for the Steam Generator Tube Integrity Program was in conformance with the staff's recommended UFSAR supplement for these types of programs provided in Table 3.1-2 of the SRP-LR.

Based on this review, the staff determines that UFSAR supplement Section A2.37 provides an acceptable UFSAR supplement summary description of the applicant's Steam Generator Tube Integrity Program because it is consistent with those UFSAR supplement summary description in the SRP-LR for Steam Generator Tube Integrity Program. The staff determines that the information in the UFSAR supplement is an adequate summary description of the program as required by 10 CFR54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Steam Generator Tube Integrity Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception 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).

3.0.3.2.17 Structures Monitoring

Summary of Technical Information in the Application. LRA Section B2.1.38 describes the existing Structures Monitoring Program as consistent, with enhancements, with the 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 incorporates inspection guidance based on recommendations contained in ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures."

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 in Commitment No. 30 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 audited 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 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 the GALL AMP XI.S6.

Enhancement 1. LRA Section B2.1.38 states an enhancement to the "scope of program" program element in that the Structures Monitoring Program will be enhanced to include additional structures, components, and component supports for inspections 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. PINGP structures, components, and component supports to be enhanced that are within the scope of license renewal monitored by the Structures Monitoring Program include the following:

- Approach Canal;
- Fuel Oil Transfer House;
- Old Administration Building and Administration Building Addition;
- Component supports for cable tray, conduit, cable, tubing tray, tubing, non-ASME vessels, exchangers, pumps, valves, piping, mirror insulation, non-ASME valves, cabinets, panels, racks, equipment enclosures, junction boxes, bus ducts, breakers, transformers, instruments, diesel equipment, housings for HVAC fans, louvers, and dampers, HVAC ducts, vibration isolation elements for diesel equipment, and miscellaneous electrical and mechanical equipment items;
- Miscellaneous electrical equipment and instrumentation enclosures including cable tray, conduit, wireway, tube tray, cabinets, panels, racks, equipment enclosures, junction boxes, breaker housings, transformer housings, lighting fixtures, and metal bus enclosure assemblies;
- Miscellaneous mechanical equipment enclosures including housings for HVAC fans, louvers and dampers;
- SBO Yard Structures and components including SBO cable vault and bus duct enclosures;
- Fire Protection System hydrant houses;
- Caulking, sealant, and elastomer materials; and
- Nonsafety-related masonry walls that support equipment relied upon to perform a function that demonstrates compliance with a regulated event(s)

The staff found this enhancement acceptable because when the enhancement is implemented, PINGP AMP B2.1.38, "Structures Monitoring Program," will be consistent with the GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2. LRA Section B2.1.38 states an enhancement to the “parameters monitored or inspected” program element to include additional inspection parameters.

The staff reviewed the applicant’s License Renewal AMP Basis Document - Structures Monitoring Program (LR-AMP-428) Revision 2, dated August 15, 2008 Table 8.1 “Managed Aging Effects” against the “parameters monitored or inspected” program element criterion 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 60 items as listed in Table 8.1 “Managed Aging Effects” to be monitored or inspected and linked them to the degradation of the particular SCs intended functions.

The staff found this enhancement acceptable because when the enhancement is implemented, PINGP AMP B2.1.38, “Structures Monitoring Program,” will be consistent with the GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 3. LRA Section B2.1.38 states an enhancement to the “detection of aging effects” program element of the Structures Monitoring Program in that the procedure will be enhanced to require an inspection frequency of once every five (5) years for the inspection of structures, supports, and structural components within the scope of this program. The applicant also stated that the frequency of inspections can be adjusted, if necessary, to allow for early detection and timely correction of negative trends. The applicant further stated that the program will be enhanced to require periodic sampling of groundwater and river water chemistries to ensure they remain non-aggressive.

The staff reviewed the applicant’s License Renewal AMP Basis Document - Structures Monitoring Program and found the visual inspection frequency, the periodic sampling of groundwater, and river water chemistries are once in every five years for the period extended operation. However, it is not clear to the staff where test samples were/are taken related to the safety-related and important-to-safety embedded concrete foundations; and the technical basis for concluding that periodic sampling will ensure that safety-related and important-to-safety embedded concrete foundations are not exposed to aggressive groundwater. Therefore, the staff issued RAI B2.1.38-1, dated November 5, 2008. In the letter dated December 5, 2008, the applicant responded that the water samples are taken from the plant’s two deep wells and from the Mississippi River adjacent to the Intake Screenhouse. The deep wells are located approximately 295 yards and 350 yards west of the safety-related and important-to-safety concrete foundations. The river water sampling location is the Mississippi River just east of the Intake Screenhouse, approximately 210 yards from the safety-related and important-to-safety concrete foundations. The applicant also stated that the test results from well and river water sampling points have continuously shown that pH, chlorides, and sulfates concentrations are within the threshold of the GALL Report (pH > 5.5, chlorides < 500ppm, and sulfates < 1500ppm). Test results include a preconstruction report in 1965 and reports spanning a 22-year period (from 1984 to 2006) which indicate that the maximum sulfates and chlorides levels recorded are 119 ppm and 89.4 ppm respectively, and pH obtained over the same time period ranges from 7.6 to 8.5. Therefore, the applicant concluded that groundwater is not aggressive. The staff found the location of the wells acceptable, and this enhancement is acceptable because when the enhancement is implemented, PINGP AMP B2.1.38, “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 OE described in LRA Section B2.1.38 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 walkdown with the applicant's technical staff to the fuel oil transfer house, screenhouse, turbine building, intake canal, approach canal, diesel generator building, administration building addition, SBO structures, and the yard. 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.

During its audit and review, the staff noticed that PINGP has identified the leakage of borated water (CAP 01064513) from the Unit 1 and Unit 2 refueling cavities and through the concrete backing the liners since 1998. Leakage was fairly consistent throughout the duration of the flooding of the refueling cavity pool (average 1 gallon per hour). Since then, the leakage path has not been specifically identified. Therefore, the staff requested the applicant to provide the results of any root cause analyses, as well as corrective and preventive actions taken to address or correct this issue in RAI B2.1.38-2, dated November 5, 2008. In the letter dated December 5, 2008, the applicant stated that the condition was detected by the ASME Section XI, Subsection IWE Program while examining the Class MC pressure retaining vessel. Both programs took corrective action to address the leakage. The staff reviewed the applicant's responses to the RAI B2.1.38-2. The staff found that:

- The leakage inside containment was first documented in 1998 during the Unit 2 refueling outage with water observed entering sump B from cracks in the grout around the RHR suction penetration sleeves at elevation 694 feet10 inches. This area is grouted from the floor of the sump to the ceiling of the sump back to the containment vessel wall.
- The chemical analysis of the fluid determined it to be similar to refueling water with a boron concentration of 2700 ppm, chloride concentration of 7 ppm, sulfate concentration of 0.2 ppm, and pH of 7.8. The boron content of the refueling pool water was measured at 2700 ppm with a pH of 5.2. (The increase in pH from the refueling cavity water to that found at the leaks was attributed to the acidity being neutralized by the carbonates and other minerals in the concrete.)
- The grout at sump B was removed to inspect the containment vessel wall revealing no degradation of the containment vessel.
- Other potential sources of leakage such as the RC, Safety Injection (SI) and Residual Heat Removal (RH) systems were investigated and no other feasible source of leakage was identified.
- During the Unit 2 outage in 2008, the plant performed over 150 ultrasonic (UT) thickness readings of the containment vessel from its exterior surface in the vicinity of

the fuel transfer tube and at the sump B location. All readings were found to exceed the nominal vessel plate thicknesses of 1 ½ inches and 3 ½ inches.

The staff also found that the diagram on page four of Encolusre 3 to the letter dated December 5, 2008, indicates that the potential leakage path follows the bottom of the containment liner. It appears to the staff that water could accumulate at the bottom of the liner and the area could remain wetted after refueling outages. Therefore, the staff did not agree with the applicant's conclusion that the steel liner was not constantly wetted for long periods of time by the boric acid solution to cause any deterioration of the steel surface. The staff needs the applicant to explain in greater detail the increase in pH from the borated refueling water (pH 5.2) to the leakage found in sump B (pH 7.8), the chemical properties of the "white deposit" found on the concrete surfaces and the possibility of calcium hydroxide $Ca(OH)_2$ leaching from the concrete, and why this leakage was omitted from the IWE OE discussion in the LRA. The staff also needs an explanation of whether or not the liner and concrete remain wetted after refueling outages, and if so how this will be managed by the AMP in the period of extended operation. The applicant provided information related to this issue during a public meeting on March 2, 2009. The staff reviewed the information provided in the RAI response and during the public meeting and by letter dated March 31, 2009, the staff issued follow-up RAI B2.1.38 asking the applicant to discuss its plan for assessing the current condition of the steel containment vessel and to explain how the IWE program, or a plant specific program will manage aging of the vessel. By letter dated April 6, 2009, the applicant responded to follow-up RAI B2.1.38. The staff also conducted an audit on May 28, 2009, to review related on-site documentation. The staff is currently reviewing the RAI response, as well as the information gathered during the audit. This is **Open Item 3.0.3.2.17-1**.

On the basis of its review, pending successful resolution of **Open Item 3.0.3.2.17-1**, 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, pending resolution of **Open Item 3.0.3.2.17-1**.

<u>UFSAR Supplement</u>. In LRA Section A2.38, 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).

<u>Conclusion</u>. On the basis of its audit and review of the applicant's Structures Monitoring Program, pending resolution of Open Item 3.0.3.2.17-1, 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. 30 prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3), pending resolution of Open Item 3.0.3.2.17-1. 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), pending resolution of Open Item 3.0.3.2.17-1.

3.0.3.2.18 Water Chemistry Control

Summary of Technical Information in the Application. LRA Section B2.1.40 describes the existing Water Chemistry Program as consistent, with exceptions and enhancement, with the GALL AMP XI.M2, “Water Chemistry.” The applicant stated that the Water Chemistry Program manages aging effects by controlling the internal environment of systems and components and that the Water Chemistry Program mitigates corrosion, SCC, and heat transfer degradation due to fouling in the primary, auxiliary (borated), and secondary water systems included within the scope of the program. The applicant further stated that the program manages aging effects by controlling concentrations of known detrimental chemical species below the levels known to cause degradation. The applicant stated that the program includes specifications for chemical species, sampling and analysis frequencies, and corrective actions for control of water chemistry, and that the program conforms to both the EPRI “PWR Primary Water Chemistry Guidelines” and the EPRI “PWR Secondary Water Chemistry Guidelines.”

Staff Evaluation. During its audit and review, the staff confirmed the applicant’s claim of consistency with the GALL Report. The staff reviewed the exceptions and 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 staff reviewed the applicant’s program basis document, on-site procedures, corrective action reports, and other plant documents that were included in the applicant’s license renewal program basis document binder for the Water Chemistry Program and that contained information supporting the applicant’s evaluation of this AMP.

The staff noted that the applicant’s plant procedures require water chemistry control in accordance with EPRI 1002884, “PWR Primary Water Chemistry Guidelines,” Revision 5, and EPRI 1008224, “PWR Secondary Water Chemistry Guidelines, Revision 6, which are more recent revisions of the EPRI PWR water chemistry guidelines than referenced in the GALL Report. The primary water chemistry guidelines are applied to the reactor coolant (primary water) and auxiliary systems containing borated water that interface with the reactor coolant system. The secondary water chemistry guidelines are applied to water in the feedwater, condensate and steam generator blowdown systems. The applicant’s Water Chemistry Program mitigates aging effects by controlling the chemical environment of systems and components exposed to primary and secondary water sources. The program relies upon inspection activities of other programs to confirm effectiveness of aging effect mitigation. The staff found these features of the applicant’s Water Chemistry Program, including use of EPRI’s more recent water chemistry guidelines, to be consistent with recommendations in the GALL Report.

The staff noted that the applicant’s Water Chemistry Program includes specifications for chemical species, sampling and analysis frequencies, and acceptance limits. These requirements are contained in plant procedures and typically are identical to or more restrictive than the requirements in the EPRI guidelines, except as noted subsequently in this SER section. Corrective actions are required for chemistry conditions that do not meet acceptance conditions consistent with Action Levels and recommendations of the EPRI guidelines. The staff noted that the applicant uses both continuous in-process and periodic sampling techniques, and additional sampling and testing is performed when unexpected results are obtained. The staff finds these features of the applicant's Water Chemistry Program to be consistent with recommendations in the GALL Report.

During the on-site review the staff noted that there are differences between the water chemistry diagnostic parameter measurements recommended in EPRI water chemistry guidelines referenced by the applicant and the water chemistry diagnostic parameter measurements as implemented by the applicant's Water Chemistry Program. These differences were identified by the applicant in their license renewal program basis document, but they were not listed in the LRA as exceptions to the GALL Report's recommendations. In a letter dated November 5, 2008, the staff issued RAI AMP B2.1.40-1 asking the applicant to explain why differences from the diagnostic parameter recommendations in the EPRI water chemistry guidelines are not identified in the LRA as exceptions to the GALL Report and to justify that with these differences the Water Chemistry Program provides adequate aging management for affected components during the period of extended operation.

The applicant responded to RAI AMP-B2.1.40-1 in a letter dated December 5, 2008. In that letter the applicant referred to discussions of water chemistry control and diagnostic parameters contained in EPRI's "PWR Primary Water Chemistry Guidelines" and "PWR Secondary Water Chemistry Guidelines." Citing appropriate sections of the EPRI guidelines, the applicant stated that water chemistry parameters which require strict control due to material integrity considerations and which are needed to manage the effects of aging, are classified as control parameters. The applicant also stated that diagnostic parameters are those that provide assistance in interpreting chemistry variations but are not required for aging management and are not within the scope of the GALL Report's Water Chemistry program. The applicant further stated that deviations in diagnostic parameters are discussed in the Water Chemistry Program basis documents but are not identified as exceptions to the GALL Report because strict adherence to the EPRI-recommended diagnostic parameter measurements is not required to ensure adequate aging management of materials in a treated water environment.

The staff reviewed the applicant's response together with applicable sections of the EPRI PWR water chemistry guidelines. The staff noted that the applicant's explanation of control and diagnostic water chemistry parameters is consistent with the discussions in the EPRI guidelines, and that the EPRI guidelines do not require strict adherence to the diagnostic parameter measurement recommendations but allow variations based on plant-specific considerations. On this basis, the staff finds the applicant's response with regard to diagnostic parameter measurements to be acceptable.

Based on its review and evaluation of the applicant's response to RAI AMP-B2.1.40, the staff finds that the applicant's response resolves all issues raised in the RAI, and no additional exceptions to the GALL Report were identified beyond those stated in the LRA.

<u>Exception 1</u>. LRA Section B2.1.40 states an exception to the "parameters monitored/inspected" program element. The exception is that feedwater samples are not monitored for total copper content, as recommended by the EPRI' Secondary Water Chemistry Guideline, because the plant is an all-ferrous plant with no copper sources.

During the on-site audit the staff asked the applicant whether there is any plant-specific data to confirm that the plant is an all-ferrous plant with no copper sources into the feedwater. In response to this request the applicant provided records from recent total metal analyses reports showing the measured copper content in the feedwater to be less than 0.005 ppb, the minimum detectable level.

The staff reviewed the applicant's AMR results for the feedwater system and for the condensate system. The staff noted that in the feedwater system there are not any copper alloy, brass or bronze components in a treated water environment; however, the staff also noted that the condensate system does include some brass and bronze valve bodies in an environment of treated water.

In a phone conversation dated February 3, 2009, the staff asked the applicant to identify the brass and bronze valves in the condensate system and to clarify whether the copper in those valves could be a potential source of copper intrusion to the feedwater system. In its response, the applicant stated that the valves are small filter vent valves or leak-off valves, which are not part of the main condensate-to-feedwater process stream and that the valves would be a highly unlikely source of copper intrusion. The applicant also stated that current chemistry department practice is to obtain a total metal analysis (including copper) of the feedwater on a weekly basis.

The staff noted that the EPRI PWR Secondary Water Chemistry Guideline recommends weekly sampling for copper in the feedwater and asked the applicant its reason for stating an exception with regard to copper sampling. The applicant stated that, although the current practice is to take total metal samples weekly that do include total copper content, there is no procedural requirement for this frequency. The applicant stated that since there is no procedural requirement and copper is a control parameter recommended in the EPRI guideline, they had conservatively identified an exception to the GALL Report's recommendation.

On the basis that the applicant confirms the presence or absence of copper ion in the condensate/feedwater systems by performing total metal analyses of condensate/feedwater samples taken from the systems, the staff finds that the applicant meets the intent of EPRI Secondary Water Chemistry Guidelines to perform monitoring of copper ions such that the identification of this as an exception for the application is unnecessary.

Exception 2. LRA Section B2.1.40 states an exception to the "acceptance criteria" program element. The exception is that primary water (reactor coolant) dissolved oxygen actions level (AL) limits are above the corresponding recommended EPRI guideline limits in EPRI TR-1002884, PWR Primary Water Chemistry Guidelines, Revision 5. The applicant stated, however, that typical plant oxygen levels are well below the EPRI action level limits and

hydrogen levels are maintained in the reactor coolant to mitigate oxidizing effects due to radiolysis or oxygen ingress.

In a letter dated November 5, 2008, the staff issued RAI AMP-B2.1.40-3 asking the applicant to provide a comparison of the dissolved oxygen action level limits in its Technical Requirements Manual against the corresponding limits in the EPRI guidelines and to provide a technical justification of why the limits in the Technical Requirements Manual provide acceptable aging management mitigation during the period of extended operation.

The applicant responded to RAI AMP-B2.1.40-3 in a letter dated December 5, 2008. In that letter the applicant provided the following quantitative comparison of reactor coolant system dissolved oxygen AL limits.

Source	AL 1	AL 2	AL 3
Technical Requirements Manual (All operating modes with reactor coolant system temperature greater than 250 ºF.)	---	Limit A < 100 ppb (Restore parameter within 24 hours)	Limit B < 1000 ppb (Unit shutdown to Mode 3 in 6 hours and Mode 5 in 36 hours)
EPRI TR-1002884, PWR Primary Water Chemistry Guidelines, Revision 5 (Power operation, reactor critical)	> 5 ppb (Restore parameter within 7 days)	---	> 100 ppb (Initiate orderly shutdown immediately)
Implementing Procedure (Power operation in Mode 1)	> 5 ppb (Restore parameter within 7 days)	>100 ppb (Restore parameter within 24 hours	>1000 ppb (Initiate orderly shutdown immediately)

In its response the applicant stated that a review of operating data for the last 10 years verified that the action level 1 limit of 5 ppb for reactor coolant system dissolved oxygen had not been exceeded during power operation. The applicant also stated that it has decided to revise the Water Chemistry Program to remove the exception. The applicant further stated that LRA, Section B2.1.40, is changed to add an enhancement to the "acceptance criteria" element of the Water Chemistry Program to require that reactor coolant system dissolved oxygen action level limits be in accordance with EPRI Guideline limits for reactor coolant system power operation control parameters. The applicant stated that the exception to the GALL Report with regard to primary water dissolved oxygen action limits is removed and the following LRA changes are made:

> In LRA Section B2.1.40, under Exceptions to NUREG-1801, the first paragraph under the second bullet, "Acceptance Criteria," concerning primary water dissolved oxygen is deleted.
>
> In LRA Section B2.1.40, under Enhancements, a new second bullet is added to read as follows: "Acceptance Criteria. The program will be enhanced to require Reactor Coolant System dissolved oxygen Action Level limits to be consistent with the limits established in the EPRI PWR Primary Water Chemistry Guidelines."

The applicant also stated that Commitment No. 32 contained in the Preliminary License Renewal Commitment List included in the LRA transmittal letter dated April 11, 2008, is revised to state that the Water Chemistry Program will be enhanced to require that reactor coolant system dissolved oxygen action level limits be consistent with the limits established in the EPRI PWR Primary Water Chemistry Guidelines.

The staff reviewed the applicant's response and the proposed LRA changes. The staff noted that by deleting Exception 2 from the LRA and providing a new enhancement to require that reactor coolant system dissolved oxygen action level limits be consistent with the limits established in the EPRI PWR Primary Water Chemistry Guidelines, the applicant is committing to eliminate the difference between its procedural limits on dissolved oxygen and the limits as recommended in EPRI guidelines. This change will result in this feature of the applicant's Water Chemistry Program being consistent with the recommendations in GALL AMP XI.M2, "Water Chemistry."

The staff finds the applicant's action levels for dissolved oxygen to be acceptable because the applicant has amended the LRA to make these actions levels consistent with the EPRI PWR Primary Water Chemistry Guidelines and because this is consistent with the recommendations in the GALL AMP XI.M2 to use these guidelines for primary coolant chemistry monitoring.

In a letter dated January 20, 2009, the applicant revised Commitment No. 32 of the list of "Preliminary License Renewal Commitments" to include a statement that the Water Chemistry Program will require reactor coolant system dissolved oxygen Action Level limits to be consistent with the limits established in the EPRI PWR Primary Water Chemistry Guidelines. The staff noted that implementation of this commitment is scheduled prior to the beginning of the period of extended operation. The staff finds this revised commitment acceptable because it ensures that this feature of the applicant's Water Chemistry Program is consistent with the recommendations in the GALL AMP XI.M2.

Based on its review of Exception 2 and changes made to the LRA in response to RAI AMP-B2.1.40-3, including the applicant's revision to Commitment No. 32, the staff finds the affected features of the applicant's Water Chemistry program to be consistent with the GALL AMP XI.M2, and therefore to be acceptable.

<u>Exception 3</u>. LRA Section B2.1.40 states an exception to the "acceptance criteria" program element in that feedwater hydrazine levels during heatup, hot shutdown, and startup (Modes 2, 3, and 4) are maintained greater than 100 ppb, which is higher, and more conservative than the 20 ppb recommended by the EPRI guidelines.

The staff noted that the applicant has recirculating steam generators and reviewed the feedwater hydrazine control parameter limit in EPRI's Pressurized Water Reactor Secondary Water Chemistry Guidelines, Revision 6, Table 5-2, Recirculating Steam Generator Heatup/Hot Shutdown and Startup Feedwater Sample. The staff noted that the hydrazine control parameter limit recommended in the EPRI report is a minimum concentration of 20 ppb. The staff also noted that the applicant uses hydrazine for oxygen control, not for pH control, and that an upper limit on hydrazine content is not specified in the EPRI guidelines when it is used for oxygen control. Because the applicant's feedwater minimum hydrazine limit is 100 ppb, which is greater than 20 ppb and conservative relative to EPRI's recommended minimum hydrazine concentration, the staff finds Exception 3 to the "acceptance criteria" program element to be acceptable.

<u>Enhancement 1</u>. LRA Section B2.1.40 states an enhancement to the "monitoring and trending" program element, to be implemented prior to the period of extended operation. The applicant stated that the program will be enhanced to require increased sampling to be performed as

needed to confirm the effectiveness of corrective actions taken to address an abnormal chemistry condition. The applicant's Preliminary License Renewal Commitment List, Commitment No. 32, includes a commitment to enhance the Water Chemistry Program to require increased sampling to be performed as needed to confirm effectiveness of corrective actions taken to address an abnormal chemistry condition.

In a letter dated November 5, 2008, the staff issued RAI AMP-B2.1.40-2 asking the applicant to explain what the current practices and procedural requirements are with regard to increased chemistry sampling after corrective actions are taken and to describe how procedures would be revised to implement the proposed enhancement.

The applicant responded to RAI AMP-B2.1.40-2 in a letter dated December 5, 2008. In that letter the applicant provided an outline of the actions required by current sampling procedures and stated that the need to conduct increased sampling is currently implemented through Chemistry History and Records Management Software (CHRMS), and special sampling requirements are implemented through the issuance of a Chemistry Manager's Special Sampling Report. The applicant stated that the enhancement is needed to ensure that the requirement to use increased sampling following an abnormal chemistry condition is formally documented in plant procedures.

The staff finds the applicant's response to RAI AMP-B2.1.40-2 and Enhancement 1 to be acceptable because the enhancement revises existing plant procedures to formally incorporate increased sampling and testing criteria that are consistent with the sampling and testing recommendations in the "monitoring and trending" program element of the GALL AMP XI.M2, and because the applicant has reflected this enhancement of the program in LRA Commitment No. 32, which was placed on UFSAR Supplement section A2.40.

Based on this review, the staff finds that the applicant's Water Chemistry program, when enhanced by Commitment No. 32, is acceptable based on the following conclusions: (1) with the exception of the specific exceptions taken against particular program element recommendations in the GALL AMP XI.M2, "Water Chemistry" (as evaluated previously), the staff has verified that the program elements for the Water Chemistry Program are consistent with those recommended in the GALL AMP XI.M2; (2) the applicant has provided an adequate basis that the exceptions taken to the GALL AMP XI.M2 are acceptable and will achieve an acceptable level of prevention or mitigation for those aging effects that are induced by chemistry-related initiated mechanisms (e.g., loss of material initiated by general, pitting or crevice corrosion or cracking that is initiated by stress corrosion or any of its forms); and (3) consistent with applicable AMR items in the LRA that couple the applicant's implementation of the Water Chemistry Program to a One-Time Inspection, the applicant will implement one-time inspections of the components in these AMRs in order to verify that the Water Chemistry Program is achieving its preventive or mitigative objectives.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.40. The applicant stated that a review of OE for the Water Chemistry Program identified no adverse trends or issues, but that some instances have occurred where chemistry parameters did not meet limits. The applicant stated that the plant has taken timely and effective corrective action in these cases and that many of these conditions were the result of equipment or plant transient conditions, such as plant startup, that were resolved once the transient condition subsided. The applicant stated that the time durations of these conditions were typically short and that no examples of component functional failures due to corrosion, cracking, or heat transfer degradation resulting from inadequate chemistry controls were identified.

The applicant stated that with the exception of the Unit 1 chemistry performance index, no adverse trends in water chemistry were identified by review of recent sampling results. The Unit 1 chemistry performance index demonstrated an adverse trend due to higher than desired sulfate levels. This issue was documented in the site's Corrective Action Program, a troubleshooting plan was prepared and implemented, and the source of the elevated sulfate was identified as main condenser tube leakage. The applicant stated that actions were taken to identify and correct the specific location of the leakage during a scheduled plant down power to access the main condenser tubes for testing and repair and that the chemistry performance index was restored to an acceptable value.

The staff reviewed the OE discussion that was provided in the applicant's license renewal program basis document binder for the Water Chemistry Program. The staff confirmed that the applicant's review of OE included evaluation of both industry and plant-specific events that have occurred since issuance of the GALL Report, Revision 1. The staff reviewed additional selected corrective action reports (ARs) related to the applicant's Water Chemistry Program and interviewed the applicant's subject matter experts for the Water Chemistry Program. Corrective action reports reviewed by the staff included ones where the applicant found species monitored and controlled by the Water Chemistry Program to be out of specification or trending in an undesirable direction. For all corrective actions reviewed, the staff noted that the applicant had performed adequate evaluations to determine a cause for the event and had taken corrective action adequate to restore operation within specification or stop continuation of an undesirable trend. Based on its review of the plant-specific OE, the staff finds that the applicant's program has demonstrated its capability to monitor, trend and control water chemistry parameters consistent with recommendations of the EPRI guidelines referenced in the GALL Report, and to implement corrective actions adequate to prevent loss of license renewal intended functions for components and systems affected by the Water Chemistry Program.

Based on this review, the staff finds (1) that the OE for this AMP demonstrates that the applicant's Water Chemistry Program is achieving its objective of managing aging by controlling the internal environment of systems and components so as to mitigate the aging effects of cracking, loss of material, or reduction of heat transfer due to fouling for materials exposed to primary, auxiliary, and secondary treated water, and (2) that the applicant is taking appropriate corrective actions when deficiencies are found 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.

<u>UFSAR Supplement</u>. In LRA Section A2.40, the applicant provided the UFSAR supplement for the Water Chemistry Program. The staff verified that the UFSAR supplement summary for the Water Chemistry Program conforms with the staff's recommended UFSAR supplement for this type of program as described in the SRP-LR.

In its letter dated April 13. 2009, the applicant provided a list of license renewal commitments. The staff verified that the applicant has included the program enhancements identified in the LRA for the Water Chemistry Program in Commitment No. 32 of the final list of license renewal commitments.

Based on this review, the staff finds that the UFSAR supplement summary in LRA Section A2.40 provides an acceptable description of the applicant's Water Chemistry Program because it is consistent with the UFSAR supplement summary description recommended in the SRP-LR for a Water Chemistry Program and because the applicant has appropriately included all program enhancements in the License Renewal Commitment list, Commitment No. 32 which is linked with UFSAR supplement Section A.2.40 and scheduled for implementation 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 audit and review of the applicant's Water Chemistry Program and the applicant's responses to RAIs AMP-B2.1.40-1, AMP-B2.1.40-2 and AMP-B2.1.40-3, the staff finds that those program elements for which the applicant claimed consistency with the GALL Report are consistent. The staff also reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. In addition, the staff reviewed the enhancements and confirms that their implementation through license renewal Commitment No. 32, prior to the period of extended operation, makes the existing AMP consistent with the GALL AMP to which it was compared, with acceptable exceptions. 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 Metal Fatigue of Reactor Coolant Pressure Boundary

Summary of Technical Information in the Application. LRA Section B3.2 describes the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program is an existing program. The applicant also states that the program will be enhanced to be consistent with the recommendations described in the GALL AMP X.M1: Metal Fatigue of Reactor Coolant Pressure Boundary.

The applicant states that the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program monitors the thermal and pressure transients experienced at the selected RCS pressure boundary components to ensure those components remain within their design fatigue usage limits. The applicant also states that the program tracks the plant temperature and pressure transients to ensure that design assumptions for cumulative transient cycles are not exceeded. The applicant further states that the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program has included monitoring the six component locations for older vintage Westinghouse plants identified in NUREG/CR-6260 as representative locations for the effect of reactor coolant environment on component fatigue life.

The applicant indicates that the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program ensures that cumulative fatigue usage of each affected primary system location is evaluated, and corrective actions taken if necessary, when the number or magnitude of accumulated thermal and pressure transients approach or exceed design cycle assumptions, or when the projected fatigue usage approaches a value of 1.0, during the life of the plant including the period of extended operation.

Staff Evaluation. During the onsite audit and review of the LRA, 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 also interviewed the applicant's technical staff and reviewed the basis documents related to the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with the GALL AMP X.M1.

The staff noted that the program description stated in PINGP LRA Section B3.2 includes a statement: "The program also uses computerized cycle-based or stress-based monitoring methods to track fatigue usage in critical high-usage components." However, as a result of the RAI 4.3.1.1-1, all references to *stress-based monitoring* will be removed. For details about RAI 4.3.1.1-1 and its impact to the PINGP LRA, please see Sections 4.3.1.1.2 and 4.3.1.3.2.

The staff noted that AMP B3.2 relies on transient cycle monitoring to evaluate the fatigue usage described in the LRA. In LRA Section 4.3, the applicant indicates that this approach tracks the number of occurrences of significant thermal and pressure transients and compares the cumulative cycles, projected to cover the renewal period, against the number of design cycles specified in the design specifications. The applicant used the projected cycles to evaluate the total cumulative usage factor for 60 years. The staff noted that for this approach to work, none of the significant events tracked should produce stresses greater than those that would be produced by the design transients, not just the number of cycles alone. Namely, the staff noted that the temperature and pressure characteristics, including their values, ranges, and rates, must all be bounded within those defined in the design specifications.

During the onsite audit, the staff interviewed the PINGP plant engineers concerning the transient monitoring method and procedures and reviewed the results. During the review of the LRA, the staff determined additional information in this regard is necessary to facilitate its evaluation of the fatigue management program. Therefore, the staff issued RAI 4.3.1-1, by letter dated February 20, 2009, in which, the staff requested the applicant to provide its basis for justifying that the monitored transient data remains bounded by those defined in the design specification.

In its response to RAI 4.3.1-1, dated February 26, 2009, the applicant stated that PINGP surveillance procedure requires that records be kept of the applicable thermal and pressure transients and these records are maintained as ongoing transient summary sheets contained in the procedure itself. The applicant also stated that the PINGP surveillance procedure lists the design pressure and temperature transients from UFSAR Section 4.1.4, and contains a summary sheet for each design transient which lists every cycle counted for that transient. The applicant further states that at least once each quarter, the program owner conducts a review of plant operating records to determine if a "cycle" has occurred for any of the design pressure or temperature transients. Then, the program owner will add the event to the proper cycle summary sheet along with a brief description of the transient cycle, if a cycle has occurred.

The applicant stated that the majority of transient cycles logged to date have been associated with heatup, cooldown and reactor trip events. The applicant stated that the historic averages of the PINGP plant heatup and plant cooldown temperature rates were approximately 40 °F/hr and 70 °F/hr, respectively. As for the reactor trip events, the applicant stated that approximately 65 percent of the reported reactor trip events in both units have occurred from an initial power level between 75 percent and 100 percent power and the remaining 35 percent of reactor trip events occurred from an initial power level lower than 75 percent of full power. For design purposes, the reactor trip transient is based on a trip from 100 percent power conditions. Therefore, the applicant states that the actual plant heatup, cooldown and reactor trip events are all bounded by the design transients.

The applicant further states that if a design limit for the number or severity of a transient were exceeded, a Corrective Action Program (CAP) would be initiated to determine the effects on system components. And the corrective action includes reanalysis, repair, or replacement of the affected components, and assessment of additional pressure boundary locations that may be affected.

Based on its review, the staff finds the applicant's response to RAI 4.3.1-1 acceptable because: (1) PINGP has developed Metal Fatigue of Reactor Coolant Pressure Boundary Program to appropriately track the number of occurrences of design cycles, (2) PINGP has developed Technical Specifications and surveillance procedures to ensure that components are maintained within the design limits, (3) PINGP has acquired records of major thermal events such as heatup, cooldown and reactor trip transients confirming that the temperature and pressure values experienced by the PINGP structural components are bounded by the design transients, (4) PINGP has developed a Corrective Action Program, which initiates and determines appropriate actions to be taken if abnormal situations should occur, and the operational procedures that PINGP adopts for the transient events tracking are consistent with the GALL Report and conservative to ensure a valid fatigue management program.

The staff notes that RAI 4.3.1-1 and the applicant response to this RAI are discussed in greater details in SER Section 4.3.1.

<u>Enhancement</u>. The applicant stated in LRA Section B3.2 that PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced in three areas: (1) monitoring of the six component/locations identified in NUREG/CR-6260, as applicable to PINGP; (2) implementing stress-based fatigue usage monitoring for selected locations subject to pressurizer insurge/outsurge transients; (3) Reducing cycle limit of the plant loading (at 5 percent per minute) and plant unloading (at 5 percent per minute) to 1835 cycles just so fatigue requirement for the RV internals baffle bolts is satisfied.

The staff noted that the enhancements stated in the LRA have been revised as a result of the RAI 4.3.1.1-1. The staff noted that RAI 4.3.1.1-1 and the applicant response to this RAI are discussed in greater details in SER Section 4.3.1.1. In the new version, for Area (1) of the enhancement (monitoring of the NUREG/CR-6260 locations), the “monitoring type” assignment to each of the six NUREG/CR-6260 locations is dropped. Previously, three monitoring types were indicated among the six NUREG/CR-6260 locations. Specifically, two of those six components/locations were assigned to stress-based fatigue usage monitoring, another two locations were assigned to cycle-based fatigue usage monitoring, and the remaining two locations were assigned to cycle counting. Area (2) of the enhancement (implementing stress-based fatigue usage monitoring) is now completely removed. The staff noted that dropping out from enhancement does not mean fatigue requirement for the affected components is ignored. Fatigue requirement for the affected components are addressed in the appropriate subsections under SER Section 4.3.

Based on its review of the program, the staff finds the enhancement described in this section acceptable because it is consistent with the GALL AMP X.M1 guidance to address the light water reactor environment effects on fatigue life of structural components. All changes made to the enhancement to remove the reference to (or performance of) *stress-based fatigue monitoring*, are necessary because FatiguePro (analytical software PINGP selected for performing the stress-based monitoring) does not follow the NRC endorsed ASME guidelines in evaluating fatigue usage. The staff noted that the changes mentioned here are caused by the issue described in RAI 4.3.1.1-1. The other part of the changes made to the enhancement is dropping out “monitoring type” assignment for each of the NUREG/CR-6260 components/locations, is acceptable because all those 6 components are now evaluated following the ASME Section III subsection NB guidelines based on the monitored transient cycles along with the guidelines in NUREG/CR-6583 and NUREG/CR-5704 to address the environmental effects.

The staff noted that under the enhancement paragraphs in LRA Section B3.2, the applicant included statements regarding acceptance criteria. As a result of RAI 4.3.1-1, however, the applicant revised the acceptance criteria. A comparison of the affected segment is as follows (in Italic typeface):

The acceptance criteria as appeared in LRA Section B3.2:

> *“… acceptance criteria will be clarified to require corrective action to be taken before a cumulative fatigue usage factor exceeds 1.0 or a design basis transient cycle limit is exceeded."*

The acceptance criteria as appeared in the response to RAI 4.3.1-1 (contained in Enclosure 1 under a letter to NRC Document Control Desk, L-PI-09-030, dated February 26, 2009):

> *“… acceptance criteria will be revised to clarify that corrective action is to be taken before any monitored location exceeds either a cumulative fatigue usage factor of 1.0 or a design basis transient cycle limit."*

The applicant indicated that the criteria described in the LRA will be replaced by the one described in the response to RAI-4.3.1-1 as shown above. The staff reviewed both versions of the acceptance criteria and found little difference between them. Both versions have addressed the limit on the cumulative usage factor (CUF) and the limits on the cycles and both versions state that corrective action will be taken either before CUF is greater than 1.0 or before the transients exceed their design cycle limits. The difference between the two versions is subtle. To wit, the new version limits corrective actions applicable to the monitored locations only whereas the original version does not impose such restrictions.

The staff noted that to enforce corrective action before either the CUF or transient cycles exceeds their respective limits is a proper way to manage aging issue associated with fatigue damage. However, the manner the criteria were stated is improper because the requirement of “before exceeding 1.0” on the CUF, and the requirement of “before exceeding the design cycles” on the cycles are automatically satisfied by all components at the beginning of services. This would result in an improbable situation (i.e., calling for corrective actions from day one).

Based on the discussion described above, the staff determined the necessity of setting appropriate bars on the CUF value and cycles, above which corrective action would be triggered to assure fatigue requirements being maintained.

Reactor internals baffle bolt fatigue transient limits of 1835 cycles of plant loading at 5 percent per minute and 1835 cycles of plant unloading at 5 percent per minute will be incorporated into the Metal Fatigue of Reactor Coolant Pressure Boundary Program and UFSAR Table 4.1-8 to conform to the baffle bolt fatigue limits discussed in LRA Section 4.3.1.2, RVIs.

On area (3) of the enhancement (reducing cycle limit of the plant loading/unloading transients), the applicant described the reason for the necessity of a reduction in cycle limit for these particular transients for this particular component (RV internals baffle bolts) in LRA Section 4.3.1.2. Details of the staff review of the subject are shown in SER Section 4.3.1.2.2. On the basis of its review, the staff found the applicant’s request of cycle limit reduction acceptable for the reasons described in SER Section 4.3.1.2.2. The applicant incorporated the new limit into the Metal Fatigue of Reactor Coolant Pressure Boundary Program as stated in Commitment No.34.

<u>Operating Experience</u>. The staff also reviewed the OE described in LRA Section B3.2. The applicant stated that it has reviewed the OE associated with the Metal Fatigue of Reactor Coolant Pressure Boundary Program and indicates the PINGP program has demonstrated the ability of effectively monitor plant transients and track the accumulation of these transients.

The applicant indicated that PINGP has factored industry experience into its program, including evaluation of thermal/operating stresses that were not considered in the original design such as evaluation of Pressurizer Surge Line Thermal Stratification which is described in NRC Bulletin 88-11 and is in progress to implement EPRI guidelines provided in “Management of Thermal Fatigue in Normally Stagnant Non-Isolable RCS Branch Lines," which is contained in EPRI Report MRP-146. The staff noted that MRP-146 presents guidelines for screening, evaluating and inspecting potential thermal fatigue cracking issues due to swirl penetration and/or valve in-leakage that may occur in normally stagnant non-isolable piping systems attached to pressurized water reactor coolant system (PWRCS) piping. As stated in MRP-146, the objective of these guidelines is to provide a common industry approach to reduce the probability of cracking and leakage from piping potentially susceptible to thermal fatigue.

The applicant indicated that it has performed evaluation of the effects of light water reactor environment on fatigue life of structural components for the six NUREG/CR-6260 components (or locations) applicable to PINGP. The applicant indicated that in performing the environmental fatigue analyses, PINGP first has to calculate the fatigue usage under the air environment for three of the NUREG/CR-6260 component locations (charging nozzle, safety injection nozzle, and residual heat removal Class 1 piping tee). That was because these three components were designed in accordance with B31.1.0 and so no explicit fatigue analysis was required in the original design report. As a result, fatigue monitoring is now expanded to include locations not previously monitored by the cycle counting program.

UFSAR Supplement. In LRA Section A.4.2, the applicant provided the UFSAR supplement for the Metal Fatigue of Reactor Coolant Pressure Boundary Program. The staff also verified that in Commitment No. 34 the applicant has committed to the enhancement of the program which is scheduled for implementation prior to the period of extended operation (August 09, 2013, for Unit 1 and October 12, 2014, for Unit 2). The staff reviewed UFSAR Supplement section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program, including the applicant's responses to RAIs 4.3.1.1-1 and 4.3.1-1, the staff concludes that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirmed that its implementation prior to the period of extended operation through Commitment No. 34 would make the existing AMP consistent with the GALL AMP. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3 AMPs Not Consistent with or Not Addressed in the GALL Report

3.0.3.3.1 Nickel Alloy Nozzles and Penetration Program

In LRA Appendix B, the applicant identified the following AMPs as plant-specific:

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.

Summary of Technical Information in the Application. By letter dated March 27, 2009, the applicant amended the Nickel-Alloy Nozzles and Penetrations Program to redefine the program as an existing plant-specific AMP for the LRA that incorporates the ten program elements for AMPs, as recommended in SRP-LR Appendix A, Section A.1.2.3, and to delete the commitment in the previous version of the AMP and in LRA Commitment No. 21 from the scope of the LRA.

LRA Section B2.1.27 as amended in the letter March 27, 2009, describes the existing Nickel-Alloy Nozzles and Penetration Program as a plant-specific AMP for those ASME Code Class 1 nickel-alloy base metal and weld components. In this amended version of the AMP, the applicant defined the AMP in terms of the 10 program elements that are recommended for

AMPs, as recommended in subsections of SRP-LR Appendix A, Section A.1.2.3 and how the program elements for this AMP are designed to conform to the general program element recommendations for condition monitoring programs, as given in the general recommendations for AMP program elements in SRP-LR Appendix A, Section A.1.2.3 and its subsections.

Staff Evaluation. The staff noted that the original version of the applicant's Nickel-Alloy Nozzles and Penetration Program indicated that the program will comply with all NRC Orders Generic Letters, and Bulletins related to PWSCC of nickel-alloys, and that the applicant reflected these activities as an LRA enhancement that is defined in LRA Commitment No. 21,

The staff also noted that by letter dated March 27, 2009, the applicant amended AMP B2.1.27, Nickel-Alloy Nozzles and Penetrations Program, to redefine the program as an existing plant-specific AMP for the LRA that incorporates the ten program elements for AMPs, as recommended in SRP-LR Appendix A, Section A.1.2.3, and to delete the commitment in the previous version of the AMP and in Commitment No. 21 from the scope of the LRA.

The staff reviewed the program elements for the Nickel-Alloy Nozzles and Penetration Program against the AMP program elements found in the in SRP-LR, Appendix A, 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. For the staff's review, the staff reviewed the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions elements against the staff's corresponding recommendations for these program elements in SRP-LR Appendix A, Section A.1.2.3. The staff's evaluations on these eight program elements are given in the paragraphs that follow. The staff evaluated the AMP's "confirmation process," and "administrative controls" program elements as part of the staff's review of the applicant's Quality Assurance Program and Administrative Controls, which is given in LRA Section B1.3 and which is evaluated in SER Section 3.0.4.

Scope of the Program. LRA Section B2.1.27 states that the program manages the aging effect of cracking due to primary water stress corrosion cracking (PWSCC) of pressure boundary and structural components constructed of Alloy 600 and welds constructed of the associated Alloy 82/182 filler metals exposed to primary coolant. The staff noted that the "scope of program" program element also stated that the scope of the Nickel-Alloy Nozzles and Penetrations Program includes the 36 Alloy 60 reactor vessel (RV) bottom mounted instrumentation (BMI) nozzles and in each unit, the four (4) Alloy 600 RV core support pads in each Unit; and the Unit 2 pressurizer surge nozzle-to-safe end dissimilar metal weld (Alloy 82). The staff noted that the applicant indicated that its program is based upon the industry guidance provided in EPRI MRP-126, "Generic Guidance for Alloy 600 Management" [EPRI Report TR-1009561, November 2004], and in NEI 03-08, "Guideline for the Management of Materials Issues" [May 2003]. The staff noted that the applicant indicated that the program complies with applicable NRC Orders, and implements applicable NRC Bulletins, Generic Letters, and staff-accepted industry guidelines.

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," and that the "scope of the program should include the specific SCs of which the program manages aging."

In the statement of consideration (SOC), 73 Federal Register 52736-50, on the updates of 10 CFR 50.55a, "codes and standards," the staff mandated new augmented inspection requirements for AMSE Code Class 1 non-upper reactor vessel closure head (RVCH) penetration nozzles components that are made from either Alloy 600 Inconel base metals or Alloy 82 or 182 Inconel weld filler metals. The staff noted that the updated rule imposes new augmented bare metal visual examinations requirements pursuant to the methods and criteria in ASME Code Case N-722, as defined, referenced and subject to the additional conditions in 10 CFR 50.55a(g)(6)(ii)(E).

The staff noted that the applicant's "scope of program" clearly identified that the scope of the AMP includes those ASME Code Class 1 components that are fabricated either from Alloy 600 based metal materials or Alloy 82 or 182 weld filler metal materials, including the Alloy 600 BMI nozzles, RV core support pads at Units 1 and 2, and the Unit 2 Alloy 82 pressurizer surge line safe end nozzle weld. The staff finds the identification of these components as being within the scope of the Nickel-Alloy Nozzles and Penetrations Program is acceptable because it is in conformance with the components that are within the scope of the new augmented inspection rule for ASME Code Class 1 nickel-alloy components made from either from Alloy 600 Inconel base metal materials or Alloy 82 or 182 Inconel weld filler metal materials.

The staff also noted that, in other program elements for this AMP, the applicant identified that the program includes augmented inspection criteria for those components that have been repaired with full structural weld overlays (FSWOLs) made of Alloy 52 or 152 Inconel weld filler metal materials. Thus, based on these additional program element criteria, the staff confirmed that the scope of applicant's Nickel-Alloy Nozzles and Penetrations Program also includes those components that have been repaired by FSWOLs made from these materials. The staff finds this to be an acceptable augmentation of the "scope of program" program element because it includes nickel alloy weld filler metal components that go beyond those that would be required to be included in the AMP under the augmented inspection requirements of 10 CFR 50.55a(g)(6)(ii)(E).

The staff noted that the applicant did not identify that the Unit 1 pressurizer surge line safe-end weld was within the scope of this AMP. However, the staff confirmed that WCAP-14574-A identifies that the Unit 1 pressurizer surge line safe-end nozzle weld is made of stainless steel weld filler metal that has been heat treated to minimize weld sensitization. The staff approved WCAP-14575-a in safety evaluation (SE) dated May 30, 1997. Based on this review, staff finds that the applicant has provided an acceptable basis for omitting the Unit 1 pressurizer surge line safe-end nozzle weld from the scope of this AMP because it is in conformance with the basis in WCAP-14574-A that this Unit 1 weld is not fabricated from either Alloy 82 or 182 Inconel weld filler metal materials or Alloy 52 or 152 improved Inconel alloy weld filler metals.

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 B2.1.27 states that the effects of PWSCC on the Unit 2 pressurizer surge nozzle weld (Alloy 82), are mitigated with a full structural weld overlay (FSWOL) on the pressurizer surge nozzle-to-safe end dissimilar metal and safe end-to-reducer stainless steel butt welds. The applicant further stated that the FSWOL was installed using Alloy 52M weld material during the Unit 2 refueling outage (2R25) in October 2008. The applicant also stated that preventive measures to mitigate PWSCC are in accordance with the PINGP Water Chemistry Program which controls concentrations of known detrimental chemical species such as chlorides, fluorides, sulfates and dissolved oxygen below the levels known to cause degradation in accordance with the EPRI PWR Primary Water Chemistry Guidelines.

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 (1) the activities for prevention and mitigation programs should be described, and (2) for condition or performance monitoring programs that do not rely on preventive actions, and thus, preventive actions need not be provided.

The staff confirmed that the Nickel Alloy Nozzles and Penetration Program provides for preventive actions to minimize PWSCC, mitigative techniques such as weld overlay repair using a PWSCC resistant material (i. e. Alloy 52M) are employed and chemical species that promote PWSCC are controlled in accordance with industry standards.

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. LRA Section B2.1.27 states the Nickel-Alloy Nozzles and Penetrations Program monitors for cracking due to PWSCC of Alloy 600/82/182 materials exposed to primary coolant through visual examinations for boric acid residues or corrosion products on the lower reactor vessel head surface and each bottom-mounted instrumentation tube penetration which are indications of leakage of primary coolant caused by PWSCC. The core support pads and the Unit 2 pressurizer surge nozzle-to-safe end weld are monitored for evidence of cracking of the Alloy 600/82/182 materials in accordance with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

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:

(1) the parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s).

(2) for condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects.

(3) for performance monitoring program, a link should be established between degradation of the particular structure or component intended function(s) and the parameter being monitored.

(4) for prevention and mitigation programs, the parameter monitored should be the specific parameter being controlled to achieve prevention or mitigation of aging effects.

The staff noted that the Nickel-Alloy Nozzles and Penetrations Program is an inspection program such that only item 1) above applies this program. The staff noted that the parameters to be monitored/inspected that are linked to specific degradation (PWSCC) are identified in the Nickel-Alloy Nozzles and Penetrations Program. The staff noted that cracking is monitored through the ISI program using visual bare metal inspection (for BMI penetration and associated welds), surface inspection (for core support pads) and volumetric inspections (for the weld overly of the Unit 2 surge nozzle). The staff also noted that volumetric, surface, and visual inspections are performed on a periodic basis such that degradation can be detected in a timely manner.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

Detection of Aging Effects. LRA Section B2.1.27 states that the program utilizes visual and volumetric examination techniques to detect cracking in Alloy 600/82/182 materials. 10 CFR 50.55a requires that all power reactors maintain an Inservice Inspection Program in accordance with the ASME Boiler and Pressure Vessel Code, Section XI. The Nickel-Alloy Nozzles and Penetrations Program implements the inspection of the Alloy 600/82/182 materials through the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. The applicant further stated that:

(1) For the reactor vessel core support pads, the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program conducts a visual VT-1 examination of the accessible interior attachment welds per Table IWB-2500-1, Examination Category B-N-2, once per Inservice Inspection interval.

(2) Inspection of the FSWOL on the pressurizer surge nozzle-to-safe end dissimilar metal weld (Alloy 82) and safe end-to-reducer stainless steel butt weld are ultrasonically examined in accordance with ASME Section XI, Nonmandatory Appendix Q, Figure Q-4300-1. Inservice examinations as described in Q-4300 are performed in accordance with the requirements of MRP-139, "Primary System Piping Butt Weld Inspection and Evaluation Guidelines," with the additional requirement of at least one ultrasonic examination within ten years of the FSWOL application.

(3) Reactor pressure vessel bottom head bare metal visual examinations are performed by removing insulation sections and/or examining under the insulation using remote viewing equipment that provides a high degree of resolution in order to identify very small volumes of boric acid that may result from Alloy 600 PWSCC. The inspections are in compliance with ASME Code Case N-722, "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials," as required by and modified by 10 CFR 50.55a(g)(6)(ii)(E).

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 AMPs should:

(1) Provide information that links the parameters to be monitored or inspected to the aging effects being managed.

(2) Describe when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program).

(3) Link the method or technique and frequency, if applicable, to plant-specific or industry-wide OE.

(4) Provide the basis for the inspection population and sample size when sampling is used to inspect a group of SCs. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

The staff noted that inspection for PWSCC using appropriate methods for the specific components are performed on a periodic basis such that cracking will be detected before the intended function is compromised. Inspection using volumetric, surface, and visual techniques are performed and scheduled in accordance with ASME Section XI, MRP-139, and the requirements of ASME Code Case N-722, "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials," as required by and modified by 10 CFR 50.55a(g)(6)(ii)(E). Therefore, the frequencies and techniques used to detect PWSCC are established in accordance with ASME code, regulatory, and industry program requirements. The staff noted that inspections would be carried out through the end of the period of extended operation.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

Monitoring and Trending. LRA Section B2.1.27 states that the program incorporates the inspection schedules and frequencies for the nickel-alloy components in accordance with the PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program and, where applicable, ASME Code Case N-722, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(E), where flaw indications detected during the required examinations are dispositioned in accordance with the Corrective Actions program. The applicant further stated that the PINGP Nickel-Alloy Nozzles and Penetrations Program ranks the reactor pressure vessel bottom head penetrations as moderate for their lower susceptibility to PWSCC given the cooler temperature environment, good volumetric examination experience, and the medium-to-high failure consequence and are inspected in accordance with ASME Code Case N-722 which requires inspection of the reactor pressure vessel bottom head penetrations every other refueling outage.

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, this program element describes how the data collected are evaluated and may also include trending, and the parameter or indicator trended should be described.

The staff noted that monitoring and trending in the applicant’s Nickel-Alloy Nozzles and Penetrations Program is acceptable because monitoring and trending is performed in accordance with ASME code requirements, EPRI MRP guidelines and ASME Code Case N-

722, subject to the modifications specified in 10 CFR 50.55a(g)(6)(ii)(E). The staff also noted that the applicant's Corrective Actions Program would provide monitoring and trending of degradation discovered during visual and volumetric examinations such that timely repair or mitigative actions will be implemented.

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 B2.1.27 states that the reactor vessel core support pads, the PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program conducts visual VT-1 examination of the accessible welds. The PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program require that indications and relevant conditions detected during examination be evaluated in accordance with ASME Section XI, Paragraph IWB-3520.1.

The applicant also stated that the Inservice Inspection requirements for the Unit 2 pressurizer surge nozzle-to-safe end weld for the extended period of operation will be in accordance with the PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, with specified limitations, modifications and NRC-approved alternatives and indications and relevant conditions detected during examination are required to be evaluated in accordance with ASME Section XI, Article IWB-3500.

The applicant also stated that the reactor pressure vessel bottom head bare metal visual examinations are performed in order to identify very small volumes of boric acid that may result from Alloy 600 PWSCC. The acceptance criteria for this examination is the lack of any relevant indication, namely evidence of any leakage arising from the penetration to head interface, and the lack of any boric acid accumulations on the carbon steel head surfaces that may result in corrosion. The acceptance standards are in accordance with ASME Section XI, Paragraph IWB-3522 per ASME Code Case N-722, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(E).

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:

(1) the acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation,

(2) the program should include a methodology for analyzing the results against applicable acceptance criteria, and

(3) qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site-specific programs.

The staff noted that acceptance criteria and basis of the Nickel-Alloy Nozzles and Penetrations Program is adequately described because the acceptance criteria are based on ASME code and regulatory requirements and that ASME code methodology and ASME Code Case N-722, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(E). The staff noted that the methodology to evaluate inspection results are acceptable because any cracking found during volumetric inspection will subjected to the acceptance criteria of ASME Code Section XI IWB-3500. Additionally, the staff noted that qualitative visual inspections are performed by qualified personnel in accordance with the ASME code and implemented through the applicant’s ISI Program.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

Corrective Actions. LRA Section B2.1.27 states that indications are evaluated per the acceptance criteria, which determine relevant flaw indications that are unacceptable for further service. The applicant further stated that if visual examination of the reactor vessel instrumentation tube penetrations (bottom head) in accordance with ASME Code Case N-722 identifies leakage or evidence of cracking, additional actions shall be performed as specified in paragraphs 10 CFR 50.55a(g)(6)(ii)(E)(2) through (4) and if PWSCC related flaws are detected in the pressurizer surge nozzle FSWOL, the repair/replacement activity will include removal of the weld overlay and the original dissimilar metal weld. The applicant also stated that repair/replacement activities comply with ASME Section XI as invoked by 10 CFR 50.55a or approved ASME Code Cases as referenced in the latest version of NRC Regulatory Guide 1.147.

The staff reviewed the applicant’s “corrective actions” program element against the criteria in SRP-LR Section A.1.2.3.7, which states that:

(1) Actions to be taken when the acceptance criteria are not met should be described. Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(2) If corrective actions permit analysis without repair or replacement, the analysis should ensure that the structure and component intended function(s) will be maintained consistent with the CLB.

The staff noted that the applicant’s corrective actions with regard to any PWSCC indications that exceed acceptance criteria are in accordance with 10 CFR 50.55a or NRC approved ASME Code Cases. The staff further noted that the applicant will remove the FSWOL and the original dissimilar weld inside diameter PWSCC is detected in the FSWOL. The staff finds that actions to be taken by the applicant when acceptance criteria are exceeded are described and will be timely because all actions are in accordance with NRC regulations, ASME Section XI, and NRC approved ASME Code cases. The staff also finds that item (2) of SRP-LR Section A.1.2.3.7 does not apply because flaws or unacceptable leakage that is an indication of PWSCC will trigger repair and replacement activities in accordance with the applicant’s Corrective Action Program.

The staff confirmed that the "corrective action" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.7. The staff finds this program element acceptable.

Operating Experience. The staff also reviewed the OE described in LRA Section B2.1.27. The applicant stated that:

(1) the PINGP Unit 2 pressurizer surge nozzle-to-safe end weld was ultrasonically examined in November 2006 and September 2008 where no reportable PWSCC indications were detected. The applicant further stated that in October 2008, following installation of the FSWOL, ultrasonic examinations (UT) were performed of the new overlay weld and the nozzle-to-safe end dissimilar metal weld. One hundred percent of the Code-required volume was achieved during the examinations where no recordable indications were detected.

(2) PINGP conducted bare metal visual examinations of the reactor vessel instrumentation tube penetrations (bottom head) in May 2006 for Unit 1 and April 2005 for Unit 2 where no indications were observed.

(3) A visual VT-1 examination of the accessible welds of the reactor vessel core support pads was conducted in October 2004 for Unit 1 and in May 2005 for Unit 2. where no recordable indications on the core support pads were detected in either Unit.

The staff noted that the applicant did not identify any leakage of the borated reactor coolant due to cracking in the bottom head penetration nozzles or the nickel alloy welds. Thus, the staff concludes that the applicant has addressed the generic OE for the bottom head penetrations because the applicant will now follow the current augmented inspection requirements, as mandated in 10 CFR 50.55a g)(6)(ii)(D) - (E) and in the ASME code cases are referenced in and subject to the limitations of these regulatory paragraphs. The staff also noted that the applicant installed a FSWOL on the Unit 2 surge nozzle-to-safe end dissimilar weld and will provide inspection of the FSWOL in accordance with ASME Section requirements and MRP-139 Guidelines implemented through the applicant's augmented ISI Program.

The staff audited the OE reports. The staff noted that the Nickel-Alloy Nozzles and Penetrations Program provide the inspection details for detection of PWSCC. The documents reviewed by the staff confirm that the plant-specific OE did not reveal any degradation not bounded by industry experience. The OE provides evidence that PWSCC will be adequately managed through the period of extended operation.

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. The applicant provided its UFSAR Supplement for the Nickel-Alloy Nozzles and Penetrations Program in PINGP LRA, Appendix A, Section A2.27. The staff verified that provisions of the UFSAR Supplement are acceptable because these provisions are in accordance with SRP-LR, Tables 3.1-2, Nickel-Alloy Nozzles and Penetrations. The staff noted, the applicant has amended the LRA to eliminate LRA Commitment No. 21 from the LRA because of the new augmented inspection bases for nickel alloy components in 10 CFR 50.55a(g)(6)(ii)(D) - (E) and ASME Code Cases N-729-1 and N-22, which are invoked (with limitations) by these paragraphs, respectively. The staff noted the applicant, by letter dated March 27, 2009, provided an update of LRA Section A2.27 that provides a plant-specific Nickel-Alloy Nozzles and Penetrations Program, which will implement inspection, mitigation, and repair/replacement activities in accordance with new requirements described above through augmentation of the ASME Section XI Inservice Inspection Program.

The staff finds that the UFSAR Supplement for the Nickel-Alloy Nozzles and Penetrations Program provides an adequate summary description of the program, as identified in the SRP-LR UFSAR Supplement, Table 3.1-2 as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's Nickel-Alloy Nozzles and Penetrations Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 Quality Assurance Program Attributes Integral to Aging Management Programs

3.0.4.1 Summary of Technical Information in Application

In Appendix A, "UFSAR Supplement," Section A2.0, "Summary Descriptions of Programs that Manage the Effects of Aging," and Appendix B, "Aging Management Programs," Section B1.3, "Quality Assurance Program and Administrative Controls," of the LRA , the applicant described the elements of corrective action, confirmation process, and administrative controls that are applied to the AMPs for both safety-related and nonsafety-related components. The PINGP quality assurance program (QAP) is used which includes the elements of corrective action, confirmation process, and administrative controls. Corrective actions, confirmation process, and administrative controls are applied in accordance with the QAP regardless of the safety classification of the components. Section A2.0 and Section B1.3, of the LRA state that the QAP implements the requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and is consistent with the NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR)," Revision 1.

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. The SRP-LR, Branch Technical Position RLSB-1, "Aging Management Review - Generic," describes ten attributes of an acceptable AMP. Three of these 10 attributes are associated with the (QA) activities of corrective action, confirmation process, and administrative controls. Table A.1-1, "Elements of an Aging Management Program for License Renewal," of Branch Technical Position RLSB-1 provides the following description of these quality attributes:

- Attribute No. 7 - Corrective Actions, including root cause determination and prevention of recurrence, should be timely;
- Attribute No. 8 - Confirmation Process, which should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective; and,
- Attribute No. 9 - Administrative Controls, which should provide a formal review and approval process.

The SRP-LR, Branch Technical Position IQMB-1, “Quality Assurance for Aging Management Programs,” states that those aspects of the AMP that affect quality of safety-related SSCs are subject to the QA requirements of 10 CFR Part 50, Appendix B. Additionally, for nonsafety-related SCs subject to an AMR, the applicant's existing 10 CFR Part 50, Appendix B, QAP may be used to address the elements of corrective action, confirmation process, and administrative control. Branch Technical Position IQMB-1 provides the following guidance with regard to the QA attributes of AMPs:

> Safety-related SCs are subject to Appendix B to 10 CFR Part 50 requirements which are adequate to address all quality related aspects of an AMP consistent with the CLB of the facility for the period of extended operation. For nonsafety-related SCs that are subject to an AMR for license renewal, an applicant has an option to expand the scope of its Appendix B to 10 CFR Part 50 program to include these SCs to address corrective action, confirmation process, and administrative control for aging management during the period of extended operation. In this case, the applicant should document such a commitment in the Final Safety Analysis Report supplement in accordance with 10 CFR 54.21(d).

The NRC staff reviewed the applicant’s AMPs described in Appendix A and Appendix B of the LRA, and the associated implementing procedures. The purpose of this review was to ensure that the QA attributes (corrective action, confirmation process, and administrative controls) were consistent with the staff’s guidance described in 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 A2.0, and Appendix B, Section B1.3, of the LRA are consistent with the staff’s position regarding QA for aging management.

3.0.4.3 Conclusion

On the basis of the NRC staff’s evaluation, the descriptions and applicability of the plant-specific AMPs and their associated quality attributes provided in Appendix A, Section A2.0, and Appendix B, Section B1.3 of the LRA, were determined to be consistent with the staff’s position regarding QA for aging management. The staff concludes that the QA attributes (corrective action, confirmation process, and administrative control) of the applicant's AMPs are consistent with 10 CFR 54.21(a)(3).

3.1 Aging Management of Reactor Vessel, Internals and Reactor Coolant System

This section of the SER documents the staff's review of the applicant's AMR results for the reactor vessel, internals, and reactor coolant system components and component groups of:

- pressurizer system
- reactor coolant system
- reactor internals system
- reactor vessel system

steam generator system

3.1.1 Summary of Technical Information in the Application

LRA Section 3.1 provides AMR results for the reactor vessel, internals, and reactor coolant systems components and component groups. LRA Table 3.1.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the ESF systems components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry OE in the determination of AERMs. The plant-specific evaluation included CRs 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 reactor vessel, RVIs, 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 a review of the AMR items that the applicant had identified as being consistent with the GALL Report 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 review are documented in SER Section 3.1.2.1.

During 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 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 reactor vessel components: flanges; nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor coolant pressure boundary piping, piping components, and piping elements exposed to reactor coolant (3.1.1-3)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.1)

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 pump and valve closure bolting (3.1.1-4)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) check Code limits for allowable cycles (less than 7000 cycles) of thermal stress range	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.1)
Stainless steel and nickel alloy reactor vessel internals components (3.1.1-5)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Nickel Alloy tubes and sleeves in a reactor coolant and secondary feedwater/steam environment (3.1.1-6)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel and stainless steel reactor coolant pressure boundary closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting (3.1.1-7)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)

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 nickel-alloy reactor coolant pressure boundary piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves (3.1.1-8)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-9)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy steam generator components (flanges; penetrations; nozzles; safe ends, lower heads and welds) (3.1.1-10)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel top head enclosure (without cladding) top head nozzles (vent, top head spray or RCIC, and spare) exposed to reactor coolant (3.1.1-11)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel steam generator shell assembly exposed to secondary feedwater and steam (3.1.1-12)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.1.2.2.2.1)
Steel and stainless steel isolation condenser components exposed to reactor coolant (3.1.1-13)	Loss of material due to general (steel only), pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.2.(2))
Stainless steel, nickel-alloy, and steel with nickel-alloy or stainless steel cladding reactor vessel flanges, nozzles, penetrations, safe ends, vessel shells, heads and welds (3.1.1-14)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.2.(3))
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant (3.1.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.2.(3))
Steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam (3.1.1-16)	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry and for Westinghouse Model 44 and 51 S/G, if general and pitting corrosion of the shell is known to exist, additional inspection procedures are to be developed	Yes	Water Chemistry Program (B2.1.40) and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3)	Consistent with GALL Report (See SER Section 3.1.2.2.2.(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
Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds (3.1.1-17)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50, and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations	Yes	TLAA	Loss of fracture toughness is a TLAA (See SER Section 3.1.2.2.3.(1))
Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles (3.1.1-18)	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance	Yes	Reactor Vessel Surveillance Program (B2.1.34)	Consistent with GALL Report (See SER Section 3.1.2.2.3.(2))
Stainless steel and nickel alloy top head enclosure vessel flange leak detection line (3.1.1-19)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	A plant-specific aging management program is to be evaluated because existing programs may not be capable of mitigating or detecting crack initiation and growth due to SCC in the vessel flange leak detection line.	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.4.(1))
Stainless steel isolation condenser components exposed to reactor coolant (3.1.1-20)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.4.(2))
Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process (3.1.1-21)	Crack growth due to cyclic loading	TLAA	Yes	TLAA	Crack growth due to cyclic loading is a TLAA (See SER Section 3.1.2.2.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux (3.1.1-22)	Loss of fracture toughness due to neutron irradiation embrittlement, void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation	No, but licensee commitment needs to be confirmed	PWR Vessel Internals Program (B2.1.32)	Consistent with Gall Report (See SER Section 3.1.2.2.6)
Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes (3.1.1-23)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes	Water Chemistry Program (B2.1.40), ASME Section XI Inservice Inspection Program (B2.1.3), and One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program (B2.1.30)	Consistent with GALL Report (See SER Section 3.1.2.2.7.(1))
Class 1 cast austenitic stainless steel piping, piping components, and piping elements exposed to reactor coolant (3.1.1-24)	Cracking due to stress corrosion cracking	Water Chemistry Program and for, CASS components that do not meet NUREG-0313, a plant-specific aging management program	Yes	Water Chemistry Program (B2.1.40) and ASME Section XI Inservice Inspection Subsection IWB, IWC, and IWD Program (B2.1.3)	See SER Section 3.1.2.2.7.(2)
Stainless steel jet pump sensing line (3.1.1-25)	Cracking due to cyclic loading	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.8.(1))
Steel and stainless steel isolation condenser components exposed to reactor coolant (3.1.1-26)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD) and plant-specific verification program	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.8.(2))

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy reactor vessel internals screws, bolts, tie rods, and hold-down springs (3.1.1-27)	Loss of preload due to stress relaxation	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation	No, but licensee commitment needs to be confirmed	PWR Vessel Internals Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.1.2.2.9)
Steel steam generator feedwater impingement plate and support exposed to secondary feedwater (3.1.1-28)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.1.2.2.10)
Stainless steel steam dryers exposed to reactor coolant (3.1.1-29)	Cracking due to flow-induced vibration	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.11)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Baffle/former assembly, Lower internal assembly, shroud assemblies, Plenum cover and plenum cylinder, Upper grid assembly, Control rod guide tube (CRGT) assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly, Thermal shield, Instrumentation support structures) (3.1.1-30)	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation	No, but licensee commitment needs to be confirmed	Water Chemistry Program (B2.1.40) and PWR Vessel Internals Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.1.2.2.12)
Nickel alloy and steel with nickel-alloy cladding piping, piping component, piping elements, penetrations, nozzles, safe ends, and welds (other than reactor vessel head); pressurizer heater sheaths, sleeves, diaphragm plate, manways and flanges; core support pads/core guide lugs (3.1.1-31)	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and FSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines	No, but licensee commitment needs to be confirmed	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3), Water Chemistry Program (B2.1.40), and Nickel-Alloy Nozzles and Penetrations Program (B2.1.27)	Consistent with GALL Report (See SER Section 3.1.2.2.13)
Steel steam generator feedwater inlet ring and supports (3.1.1-32)	Wall thinning due to flow-accelerated corrosion	A plant-specific aging management program is to be evaluated	Yes	Not Applicable	Not applicable to PINGP (See SER Section 3.1.2.2.14)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy reactor vessel internals components (3.1.1-33)	Changes in dimensions due to void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation	No, but licensee commitment needs to be confirmed	PWR Vessel Internals Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.1.2.2.15)
Stainless steel and nickel alloy reactor control rod drive head penetration pressure housings (3.1.1-34)	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection, Subsections (IWB, IWC, and IWD) and the Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement commitment to implement plant commitments to applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines	No, but licensee commitment needs to be confirmed	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3) and Water Chemistry Program (B2.1.40)	Consistent with GALL Report (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 stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines	No, but licensee commitment needs to be confirmed	Not applicable	Not applicable. (See SER Section 3.1.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel alloy, stainless steel pressurizer spray head (3.1.1-36)	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Water Chemistry and One-Time Inspection and, for nickel alloy welded spray heads, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines	Not, unless licensee commitment needs to be confirmed	Water Chemistry Program (B2.1.40), and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.1.2.2.16.2)
Stainless steel and nickel alloy reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Lower internal assembly, CEA shroud assemblies, Core shroud assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly) (3.1.1-37)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation	No, but licensee commitment needs to be confirmed	Water Chemistry Program (B2.1.40) and PWR Vessel Internals Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.1.2.2.17)
Steel (with or without stainless steel cladding) control rod drive return line nozzles exposed to reactor coolant (3.1.1-38)	Cracking due to cyclic loading	BWR CR Drive Return Line Nozzle	No	Not applicable	Not applicable to PWRs
Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant (3.1.1-39)	Cracking due to cyclic loading	BWR Feedwater Nozzle	No	Not applicable	Not applicable to PWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy penetrations for control rod drive stub tubes instrumentation, jet pump instrumentation, standby liquid control, flux monitor, and drain line exposed to reactor coolant (3.1.1-40)	Cracking due to stress corrosion cracking, Intergranular stress corrosion cracking, cyclic loading	BWR Penetrations and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 NPS; nozzle safe ends and associated welds (3.1.1-41)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant (3.1.1-42)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel ID Attachment Welds and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant (3.1.1-43)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel alloy core shroud, core plate, core plate bolts, support structure, top guide, core spray lines, spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes (3.1.1-44)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Not applicable	Not applicable to PWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to reactor coolant (3.1.1-45)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Not applicable	Not applicable to PWRs
Nickel alloy core shroud and core plate access hole cover (mechanical covers) (3.1.1-46)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel-alloy reactor vessel internals exposed to reactor coolant (3.1.1-47)	Loss of material due to pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Not applicable	Not applicable to PWRs
Steel and stainless steel Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant (3.1.1-48)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (for stainless steel only), and thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	Not applicable	Not applicable to PWRs
Nickel alloy core shroud and core plate access hole cover (welded covers) (3.1.1-49)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and, for BWRs with a crevice in the access hole covers, augmented inspection using UT or other demonstrated acceptable inspection of the access hole cover welds	No	Not applicable	Not applicable to PWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
High-strength low alloy steel top head closure studs and nuts exposed to air with reactor coolant leakage (3.1.1-50)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Reactor Head Closure Studs	No	Not applicable	Not applicable to PWRs
Cast austenitic stainless steel jet pump assembly castings; orificed fuel support (3.1.1-51)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	Not applicable	Not applicable to PWRs
Steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems (3.1.1-52)	Cracking due to stress corrosion cracking, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B2.1.6)	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 PINGP. (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 PINGP. (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	ASME Section XI Inservice Inspection Subsection IWB, IWC, and IWD Program	No	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3)	Consistent with the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Cooper 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 PINGP (See SER Section 3.1.2.1.1)
Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250 C (>482 F) (3.1.1-57)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Thermal Aging Embrittlement of CASS (B2.1.39)	Consistent with GALL Report
Steel reactor coolant pressure boundary external surfaces exposed to air with borated water leakage (3.1.1-58)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion (B2.1.4)	Consistent with GALL Report
Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end, AFW nozzles and safe ends exposed to secondary feedwater/steam (3.1.1-59)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Flow-Accelerated Corrosion Program (B2.1.17) Steam Generator Tube Integrity Program (B2.1.37)	Consistent with the GALL Report (See SER Section 3.1.2.1.2)
Stainless steel flux thimble tubes (with or without chrome plating) (3.1.1-60)	Loss of material due to wear	Flux Thimble Tube Inspection	No	Flux Thimble Tube Inspection Program (B2.1.18)	Consistent with GALL Report
Stainless steel, steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F) (3.1.1-61)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	No	ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program (B2.1.3)	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, 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 PINGP (See SER Section 3.1.2.1.1)
Steel reactor vessel flange, stainless steel and nickel alloy reactor vessel internals exposed to reactor coolant (e.g., upper and lower internals assembly, CEA shroud assembly, core support barrel, upper grid assembly, core support shield assembly, lower grid assembly) (3.1.1-63)	Loss of material due to wear	Inservice Inspection (IWB, IWC, and IWD)	No	ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program (B2.1.3)	Consistent with GALL Report
Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components (3.1.1-64)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry	No	ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program (B2.1.3) and Water Chemistry Program (B2.1.40)	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
Nickel alloy reactor vessel upper head and control rod drive penetration nozzles, instrument tubes, head vent pipe (top head), and welds (3.1.1-65)	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	No	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3), Water Chemistry Program (B2.1.40), and Nickel-Alloy Nozzles and Penetrations Program (B2.1.27)	Consistent with GALL Report
Steel steam generator secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/or steam (3.1.1-66)	Loss of material due to erosion	Inservice Inspection (IWB, IWC, and IWD) for Class 2 components	No	Not applicable	Not applicable to PINGP (See SER Section 3.1.2.1.1)
Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant (3.1.1-67)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3) and Water Chemistry (B2.1.40)	Consistent with GALL Report
Stainless steel, steel with stainless steel cladding Class 1 piping, fittings, pump casings, valve bodies, nozzles, safe ends, manways, flanges, CRD housing; pressurizer heater sheaths, sleeves, diaphragm plate; pressurizer relief tank components, reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings (3.1.1-68)	Cracking due to stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3) and Water Chemistry (B2.1.40)	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, nickel alloy safety injection nozzles, safe ends, and associated welds and buttering exposed to reactor coolant (3.1.1-69)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program (B2.1.3) and Water Chemistry (B2.1.40)	Consistent with GALL Report
Stainless steel; steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant (3.1.1-70)	Cracking due to stress corrosion cracking, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	Inservice Inspection (IWB, IWC, and IWD) (B2.1.3), Water chemistry (B2.1.40), and One-Time Inspection of ASME Code Class 1 Small-bore Piping (B2.1.30)	Consistent with GALL Report
High-strength low alloy steel closure head stud assembly exposed to air with reactor coolant leakage (3.1.1-71)	Cracking due to stress corrosion cracking; loss of material due to wear	Reactor Head Closure Studs	No	Reactor Head Closure Stud Program (B2.1.33)	Consistent with GALL Report
Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater steam (3.1.1-72)	Cracking due to OD stress corrosion cracking and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity (B2.1.37) Water Chemistry (B2.1.40	Consistent with the GALL Report
Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant (3.1.1.-73)	Cracking due to primary water stress corrosion cracking	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity (B2.1.37) Water Chemistry (B2.1.40	Consistent with the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary feedwater/steam (3.1.1-74)	Cracking due to stress corrosion cracking, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity Program (B2.1.37) and Water Chemistry Program (B2.1.40), or One-Time Inspection (B2.1.29) and Water Chemistry Program (B2.1.40)	Consistent with GALL Report (See SER Section 3.1.2.1.3)
Nickel alloy once-through steam generator tubes exposed to secondary feedwater/steam (3.1.1-75)	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to PINGP (See SER Section 3.1.2.1.1)
Steel steam generator tube support plate, tube bundle wrapper exposed to secondary feedwater/steam (3.1.1-76)	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity (B2.1.37) Water Chemistry (B2.1.40)	Consistent with the GALL Report
Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater/steam (3.1.1-77)	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to PINGP (See SER Section 3.1.2.1.1)
Steel steam generator tube support lattice bars exposed to secondary feedwater/steam (3.1.1-78)	Wall thinning due to flow-accelerated corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to PINGP (See SER Section 3.1.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel alloy steam generator tubes exposed to secondary feedwater/ steam (3.3.1-79)	Denting due to corrosion of steel tube support plate	Steam Generator Tube Integrity; Water Chemistry and, for plants that could experience denting at the upper support plates, evaluate potential for rapidly propagating cracks and then develop and take corrective actions consistent with Bulletin 88-02	No	Steam Generator Tube Integrity (B2.1.37) Water Chemistry (B2.1.40)	Consistent with the GALL Report
Cast austenitic stainless steel reactor vessel internals (e.g., upper internals assembly, lower internal assembly, CEA shroud assemblies, control rod guide tube assembly, core support shield assembly, lower grid assembly) (3.1.1-80)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	Thermal Aging and Neutron Irradiation Embrittlement of CASS (B2.1.39)	Consistent with GALL Report (See SER Section 3.1.2.1.4)
Nickel alloy or nickel-alloy clad steam generator divider plate exposed to reactor coolant (3.1.1-81)	Cracking due to primary water stress corrosion cracking	Water Chemistry	No	Water Chemistry Program (B2.1.40)	Consistent with GALL Report
Stainless steel steam generator primary side divider plate exposed to reactor coolant (3.1.1-82)	Cracking due to stress corrosion cracking	Water Chemistry	No	Water Chemistry Program (B2.1.40)	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; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor vessel internals and reactor coolant pressure boundary components exposed to reactor coolant (3.1.1-83)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Program (B2.1.40)	Consistent with GALL Report
Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater/steam (3.1.1-84)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	No	Not applicable.	Not applicable to PINGP. (See SER Section 3.1.2.1.1)
Nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.1.1-85)	None	None	NA	None	Consistent with the GALL Report
Stainless steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (External); air with borated water leakage; concrete; gas (3.1.1-86)	None	None	NA	None	Consistent with the GALL Report
Steel piping, piping components, and piping elements in concrete (3.1.1-87)	None	None	NA	Not applicable	Not applicable to PINGP (See SER Section 3.1.2.1.1)

The staff’s review of the reactor vessel, reactor vessel internals (RVIs), and reactor coolant system component groups followed any one of several approaches. One approach, documented in SER Section 3.1.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.1.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.1.2.3, reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the reactor vessel, RVIs, 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 pressurizer, reactor coolant, reactor internals, reactor vessel, and steam generator systems components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- Bolting Integrity Program
- Boric Acid Corrosion Prevention Program
- Closed-Cycle Cooling Water System Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Flux Thimble Tube Inspection Program
- Lubricating Oil Analysis Program
- Nickel-Alloy Nozzles and Penetrations Program
- Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program
- One-Time Inspection Program
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program
- PWR Vessel Internals Program
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program
- Selective Leaching of Materials Program
- Steam Generator Tube Integrity Program
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program
- Water Chemistry Program

LRA Tables 3.1.2-1 through 3.1.2-5 summarize AMRs for the pressurizer, reactor coolant, reactor internals, reactor vessel, and steam generator systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff reviewed these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff reviewed these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff reviewed these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff reviewed these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff reviewed these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff 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, RVIs, 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 determined were in need of additional clarification and assessment. The staff's evaluations of these AMRs are provided in the subsection that follows

3.1.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.1.1, items 11 and 38 to 51, the applicant states that the corresponding AMR items in GALL Report are not applicable to PINPG because the AMR items in the GALL Report are only applicable to particular components in BWR reactor designs and because PINGP is a Westinghouse-designed PWR facility. The staff verified that the stated AMR items in the GALL Report are only applicable to BWR designed facilities and are not applicable to the PINGP LRA.

In LRA Table 3.1.1, items 35, 66, 75, and 84, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP does not have once-through steam generators. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP has no once-through steam generators. PINGP steam generators are recirculating, as described in UFSAR for Unit 1 and Unit 2. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

In LRA Table 3.1.1, item 87, the applicant states that further evaluation in LRA Section 3.5.2.2.1.4 concluded that steel components in concrete are not susceptible to aging and do not require aging management. The staff noted this item applies to GALL line item IV.E-6 (RP-01), which indicates that there is no aging effect for this component type and environment, and therefore do not require an AMP. Therefore, the staff agrees with the applicant in that this line item does not require aging management.

In LRA Table 3.1.1, item 53, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP does not have steel piping, piping elements, and components of the Reactor Vessel, Vessel Internals, or Reactor Coolant System exposed to closed-cycle cooling water. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP does not have steel piping, piping elements and components of the Reactor Vessel, Vessel Internals, or Reactor Coolant System exposed to closed cycle cooling water. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

In LRA Table 3.1.1, item 54, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP does not have copper alloy piping components in the Reactor Vessel, Vessel Internals, or Reactor Coolant System. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP does not have copper alloy piping components in the Reactor Vessel, Vessel Internals, or Reactor Coolant System. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

In LRA Table 3.1.1, item 56, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP does not have copper alloy > 15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water in the Class 1 Reactor Vessel, Vessel Internals, or Reactor Coolant System. 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 PINGP.

In LRA Table 3.1.1, item 62, the applicant indicates that the corresponding AMR result line in the GALL Report is not applicable because no PINGP AMR line items correspond to this item. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that cracking of stainless steel components exposed to reactor coolant is addressed in the evaluation of fatigue in other line items. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

In LRA Table 3.1.1, items 77, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP does not use phosphate chemistry. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP does not use phosphate chemistry. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

In LRA Table 3.1.1, items 78, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP steam generators do not have lattice bars. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP steam generators have tube support plates instead of lattice bars. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

3.1.2.1.2 Loss of Material due to Flow Accelerated Corrosion

In LRA Table 3.1.2-5, the applicant identified that loss of material due to flow accelerated corrosion (FAC) is an applicable AERM for the Unit 2 carbon steel feedwater inlet nozzle thermal sleeve under exposure to an external treated water environment. In this AMR item, the applicant applied Note E, which indicated consistency with the GALL Report item for material, environment, and aging effect, but credited a different AMP. The applicant indicated that the

LRA AMP B2.1.37, “Steam Generator Tube Integrity Program,” will manage the loss of material due to FAC in the external feedwater inlet nozzle thermal sleeve surfaces. The staff reviewed the AMR item against the applicant’s Steam Generator Integrity Program.

The staff noted that the industry, working through EPRI, has implemented steam generator programs that included control of secondary-side water chemistry and upgrades in secondary-side equipment. NEI 97-06 stated that industry's steam generator programs have matured to include improvements in programmatic features, such as degradation-specific management, which have been incorporated into a series of EPRI seam generator programs guidelines. EPRI Steam Generator Integrity Assessment Guidelines provide guidance for degradation assessments such as degradation mechanisms, industry experience for applicability, and inspections. NEI 97-06 states that secondary-side visual inspections are to be performed, and describes the scope of inspection and the inspection procedures and methodology to be used.

In LRA B2.1.37, the applicant stated that its Steam Generator Tube Integrity Program incorporates the guidance of NEI 97-06. The applicant stated that its Steam Generator Tube Integrity Program is implemented in accordance with Technical Specification (TS) 5.5.8 and applicable industry guidance. The applicant stated that the program manages aging effects through a balance of prevention, inspection, and evaluation. The applicant stated that visual examinations are conducted on sleeves, and that visual inspections are performed to identify degradation of secondary side steam generator internal components.

The staff approved the applicant’s response to NRC Generic Letter 97-06, and the amendment to its TSs, which included monitoring of the Unit 2 feedwater inlet nozzle thermal sleeves. In its response to GL 97-06, the applicant committed to implement its Steam Generator Integrity Program as described in NEI 97-06, “Steam Generator Program Guidelines.” The staff determined that the Steam Generator Tube Integrity Program included the implementation of the NEI 97-06 guidelines, and that the implementation procedures include visual inspections of feedwater inlet nozzle thermal sleeves to look for evidence of loss of material on external surfaces. The staff finds that the applicant’s AMP provides adequate assurance that the thermal sleeves will be able to perform their intended functions during the period of extended operation.

Based on the programs identified, 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 operations as required by 10 CFR 54.21(a)(3).

3.1.2.1.3 Cracking due to Stress Corrosion Cracking; Loss of Material due to Crevice Corrosion and Fretting

LRA Table 3.1.2-5 includes AMR result lines referring to LRA Table 3.1.1, item 3.1.1-74, that credit the One-Time Inspection Program and the Water Chemistry Program to manage cracking due to stress corrosion cracking (SCC) and loss of material due to crevice and pitting corrosion in nickel alloy steam flow limiters in a steam environment in the Unit 1 steam generator system. For the AMR result lines crediting the One-Time Inspection Program, the applicant cited generic Note E, indicating that the material, environment, and aging effect are all consistent with the GALL Report, but a different AMP is credited. For the AMR result lines showing an aging effect of loss of material due to pitting corrosion, the applicant cited plant-specific Note 101, which states that the aging mechanism is not in the GALL Report for this component, material, and environment combination.

The applicant referenced LRA Table 3.1-1, item 3.1.1-74 and GALL Report items IV.D1-14 and IV.D1-15. The staff reviewed the AMR results lines that reference Note E and confirmed 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.M19, "Steam Generator Tube Integrity," the applicant proposed using the One-Time Inspection Program.

During the audit and review, the staff asked the applicant to explain why the steam flow limiters in the Unit 1 steam generator were treated differently from other steam generator components. In response to this request, the applicant stated that the Unit 1 steam generators are not original equipment and are a different design from Unit 2 steam generators, which are original equipment. The applicant stated that the Unit 1 steam generator design includes additional steam flow limiters in the steam line exit nozzles. The applicant stated that because of this difference in Unit 1 and Unit 2 equipment design, it had elected not to include the Unit 1 steam generator flow limiters in the Steam Generator Tube Integrity Program, but to perform a one-time inspection of the unique Unit 1 components.

The staff reviewed the applicant’s Water Chemistry Program. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program provides mitigation for cracking due to SCC and mitigation for loss of material due to crevice and pitting corrosion in nickel alloy components. The staff reviewed the applicant’s One-Time Inspection Program. The staff’s evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the One-Time Inspection Program is adequate to detect the presence or note the absence of cracking due to SCC and of loss of material due to pitting and crevice corrosion for components within its scope. Based on the staff’s determination that the Water Chemistry Program provides mitigation and the One-Time Inspection Program provides detection for the aging effects of cracking due to SCC and loss of material due to pitting and crevice corrosion, the staff finds the applicant’s proposed AMPs for managing the aging effect of cracking due to SCC and loss of material due to pitting and crevice corrosion in the nickel alloy Unit 1 steam flow limiters to be acceptable.

Based on the programs identified, the staff concludes that the applicant’s proposed programs are acceptable for managing the aging effects in the applicable components. 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).

3.1.2.1.4 Loss of Fracture Toughness due to Thermal Aging and Neutron Irradiation Embrittlement

In LRA Table 3.1.1, AMR item 3.1.1-80, addresses loss of fracture toughness due to thermal aging (embrittlement) and neutron irradiation (radiation) embrittlement for CASS RVI components exposed to the external borated treated water environment of the reactor coolant, which for the RVI components includes an integrated neutron flux (i.e., neutron fluence) environment.

The LRA credits the PINGP AMP B2.1.32 “PWR Vessels Internals Program” to manage this aging effect for the CASS BMI column cruciforms in an external treated water environment only. The Table 2 AMR items in the GALL Report that correspond to LRA AMR item 3.1.1-80 are IV.B2-21 and IV.B2-37, which pertain to aging management of reduction of fracture toughness due to thermal aging and neutron irradiation embrittlement of lower support castings, lower support columns, and upper support columns that are fabricated from CASS. In these AMR items, the staff recommends that GALL AMP XI.M13 “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel” be credited to manage loss of fracture toughness as a result of exposing the components to the reactor coolant with integrated neutron flux environment. The LRA Table 2 AMR line items that reference this line item in GALL Report Table 1 cite generic note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different AMP is credited. (The staff verified that the lower and upper support columns were fabricated from wrought austenitic stainless steel and the design uses a stainless steel forging instead of stainless steel casting, and thus for these components the guidance in GALL AMR items IV.B2-21 and IV.B2-27 are not applicable to the components because the stainless steel in the components was not made using a cast fabrication method.) However, the staff also confirmed that the applicant did align its AMR item on fracture toughness of the BMI column cruciforms to GALL item IV.B2-21 because the components were fabricated from CASS materials. The staff also noted that, for these components, the applicant credited its PWR Vessel Internals Program to manage reduction of fracture toughness due to thermal aging and neutron irradiation embrittlement in lieu of crediting a program corresponding to GALL AMP XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel.”

By letter dated December 18, 2008 the staff issued RAI 3.1.1-1 requesting the applicant to provide its basis for crediting PINGP AMP B2.1.32 “PWR Vessels Internals Program” in lieu of the recommended GALL AMP XI.M13 “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel” Program. By letter dated January 20, 2009, the applicant provided its response to RAI 3.1.1-1. In this response, the applicant clarified that the PINGP PWR Vessel Internals Program is based on the activities of the EPRI MRP for managing the aging effects for RVI components, including the BMI column cruciforms that are made from CASS. The applicant clarified that the augmented activities of the program are augmented inspection activities for the components that go beyond the applicable ASME Section XI ISI requirements for the RVI components in Table IWB-2500-1, Examination Category B-N-3 for removable core support structures. The applicant stated that the PWR Vessel Internals Program is based on the provisions of LRA Commitment No. 25, which commits to the following activities and actions for the management of aging in RVI components:

- Participate in the industry programs for investigating and managing aging effects on reactor internals;
- Evaluate and implement the results of the industry programs as applicable to the reactor internals; and
- Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

The staff reviewed the applicant's AMP B2.1.32 "PWR Vessels Internals Program," and the staff's evaluation is documented in SER Section 3.0.3.1.21. The staff confirmed that, in a letter dated February 6, 2009 the applicant submitted its License Renewal Commitment List for the PINGP LRA and placed these commitments in the UFSAR Supplement for the application. The staff verified that, in Commitment No. 25, the applicant committed to implementing AMP B2.1.32, "PWR Vessels Internal Program" at least two years prior to the period of extended operation. The staff also verified that Commitment No. 25 includes the actions and activities listed in the bullets above.

Based on a review of the requirements in the ASME Code Section XI for PWR RVI components, the staff noted that PWR RVI components may be categorized into one of the following two groups:

- Those RVI components that are ASME Code Class 1 components and are within the scope of the staff's inservice inspection requirements of 10 CFR 50.55a and ASME Code Section XI, Examination Category B-N-1 for interior of the reactor vessel, B-N-2 for weld core support structure components, or B-N-3 for removable core support structure components
- RVI components that are not ASME Code Class and thus are not subject to the ASME Code Section XI, Examination Category B-N-1, B-N-2, or B-N-3 requirements

In the 2005 update of the SRP-LR and the GALL Report, the NRC recommended that aging management of PWR vessel internals needs to be done on a consistent basis among licensed PWRs in the U.S. to account for the fact that not all of the PWR RVI components are ASME Code Class and to account for the fact that additional aging management measures may be necessary for some of the non-ASME Code Class PWR RVI components. Hence, the staff updated its aging management basis in the AMRs for PWR RVI components in the GALL Report through the following recommended commitment that was recommended to be adopted in the UFSAR Supplements for PWR LRAs:

> "(1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval."

Thus, for current Westinghouse-designed PWR LRAs pending staff approval, the staff's updated basis for managing the aging effects that are attributed to the RVI components is given in NRC NUREG-1833, Table IIIC, which states the following:

> "The AMP column was changed to delete reference to XI.M16 (AMP M16 was also deleted from the GALL report) and instead require a commitment in the FSAR Supplement to apply industry programs to be developed in the future for proper management of reactor internals. Also, added to the further evaluation column the requirement for the licensee commitment to be confirmed."

The commitment that is recommended by the staff includes a provision for PWR applicant's to submit an inspection plan for their RVI components that is based on the industry's augmented inspection program recommendations for PWR RVI components to the NRC for review and approval at least two years prior to entering the period of extended operation.

The staff has noted that the applicant is relying on the activities of the EPRI MRP to form the basis of the applicant's augmented inspection program for the RVI components. The EPRI MRP activities include an assessment on whether loss of material, cracking, loss of fracture toughness, changes in dimension, and for fastened, keyed or bolted RVI connections, loss of preload are aging effects that need to be managed for the period of extended operation, and if so include recommendations to perform augmented inspections of these components. The staff noted that the applicant has incorporated this aging management basis in LRA Commitment No. 25, which includes a commitment to participate in the MRP activities for Westinghouse designed RVI components, to implement the MRP recommendations that are applicable to the RVI component designs at PINGP, and to submit either a MRP-based or plant-specific inspection plan for these components for NRC review and approval at least two years from the time PINGP is scheduled to enter the period of extended operation.

The staff considers this to be a sufficient aging management basis for the PINGP because: (1) the applicant's commitment for RVI components, as placed in the PWR Vessel Internals Program and in LRA Commitment No. 25 is consistent with the commitment recommendation for RVI components as given in Sections 3.1.2.2.6, 3.1.2.2.9, 3.1.2.2.12., 3.1.2.2.15, and 3.1.2.2.17 of the SRP-LR and in the AMRs of the GALL Report associated with these SRP-LR Sections, (2) the augmented inspection plan for the RVI components will supplement those mandated ISI that are required to be implemented in accordance with ASME Code Section XI Examination Categories B-N-1, B-N-2, or B-N-3 requirements, and (3) the inspection plan that will be submitted in accordance with LRA Commitment No. 25 will be subject to an NRC review and approval process. On this basis the staff finds that the applicant has provided an acceptable basis for managing the aging effects that are applicable to the RVI components at PINGP, and specifically as a basis for managing loss of fracture toughness in the BMI column cruciforms that are fabricated from CASS. Thus, the staff resolved its concern in RAI 3.1.1-1.

On the basis of the staff's evaluation of the AMP and the applicant's Commitment No. 25, the staff finds the applicant's use of the PWR Vessels Internals Program acceptable. 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 aging management, as recommended by the GALL Report, for the reactor vessel, internals, and reactor coolant system components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of fracture toughness due to neutron irradiation embrittlement

- cracking due to SCC and IGSCC
- crack growth due to cyclic loading
- loss of fracture toughness due to neutron irradiation embrittlement and void swelling
- cracking due to SCC
- cracking due to cyclic loading
- loss of preload due to stress relaxation
- loss of material due to erosion
- cracking due to flow-induced vibration
- cracking due to SCC and irradiation-assisted stress corrosion cracking (IASCC)
- cracking due to primary water stress corrosion cracking (PWSCC)
- wall thinning due to FAC
- changes in dimensions due to void swelling
- cracking due to SCC and PWSCC
- cracking due to SCC, PWSCC, and IASCC
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the 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

In LRA Table 3.1.1, items 2, 3, and 4, the applicant states that the AMR result lines are not applicable. The staff reviewed the corresponding AMR result lines in the SRP-LR and noted that they apply only to boiling water reactors (BWRs). On this basis, the staff agrees with the applicant's determination that LRA Table 3.1.1, items 2, 3, and 4, are not applicable, because PINGP is a PWR.

LRA Table 3.1.1, items 1 and 5 through 10, are AMR result lines with an aging effect of cumulative fatigue. SER Section 4.3 documents the staff's review of the applicant's evaluation of these TLAAs.

3.1.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

(1) LRA Section 3.1.2.2.2.1 addresses the applicant's evaluation for LRA Table 3.1.1, item

3.1.1-12. In the LRA, the applicant stated that this line applies for GALL line item IV.D2-8 (R-244), which is applicable only for PWR once-through steam generators. The applicant stated that it does not have once-through steam generators, and this line is not applicable.

The staff reviewed LRA Section 3.1.2.2.2.1 against the criteria in SRP-LR Section 3.1.2.2.2.1, which states that loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator shell assembly exposed to secondary feedwater and steam.

The staff confirmed that GALL line item IV.D2-8 (R-244) is the only PWR component group referencing this Table 3.1.1 line item and that it is applicable only for once-through steam generators. The AMR results for comparable components in a recirculating steam generator are provided by the applicant in LRA Table 3.1.1, item 3.1.1-16. On the basis that the applicant has recirculating steam generators, and AMR results for the applicant's recirculating steam generators are provided in LRA Table 3.1.1, item 3.1.1-16, the staff finds the applicant's determination that the AMR results in Table 3.1.1, item 3.1.1-12 are not applicable to be acceptable.

(2) SRP-LR Section 3.1.2.2.2.2 states that loss of material due to pitting and crevice corrosion may occur in stainless steel BWR isolation condenser components exposed to reactor coolant. Loss of material due to general, pitting, and crevice corrosion may occur in steel BWR isolation condenser components.

The staff noted that PINGP is a PWR, and therefore does not have BWR isolation condenser components. Therefore, the criteria specified in SRP-LR Section 3.1.2.2.2.2 does not apply to PINGP.

(3) SRP-LR Section 3.1.2.2.2.3 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, vessel shells, heads, and welds exposed to reactor coolant.

SRP-LR 3.1.2.2.2.3 references GALL items IV.A1-8 and RP-25, and is identified as an item specific to BWRs. The staff noted that PINGP is a PWR, and therefore does not have BWR isolation condenser components. Therefore, the criteria specified in SRP-LR Section 3.1.2.2.2.3 does not apply to PINGP.

(4) The applicant states in LRA Section 3.1.2.2.2.4 that loss of material due to general, pitting and crevice corrosion could occur for steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. (The LRA further states that 1) this aging effect is managed with a combination of the Water Chemistry Program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program; 2) the Water Chemistry Program controls detrimental contaminants such as halogens and sulfates that could cause corrosion and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides for periodic visual, surface, and/or volumetric examinations of Class 1, 2, and 3 pressure-retaining components, their welded integral attachments, and bolting; 3) leakage tests are periodically performed on Class 1, 2, and 3 pressure-retaining components; and 4) the provisions of ASME Section XI are augmented by additional inspections to detect general and pitting corrosion on the shell to transition cone weld of the Westinghouse Model 51 steam generators in Unit 2.)

The staff reviewed LRA Section 3.1.2.2.2.4 against the criteria in SRP-LR Section 3.1.2.2.2.4, which states that loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. The SRP-LR Section 3.1.2.2.2.4 also states that the existing program relies on control of chemistry to mitigate corrosion and Inservice Inspection (ISI) to detect loss of material and that the GALL Report recommends augmented inspection to manage this aging effect and clarifies that this issue is limited to Westinghouse Model 44 and 51 Steam Generators where a high stress region exists at the shell to transition cone weld.

SRP-LR Section 3.1.2.2.2.4, AMR item 16 in Table 1 of the GALL Report, Volume 1, and GALL AMR item IV.D1-12, are applicable to loss of material in recirculating steam generator upper and lower shell and transition shell-to-cone welds in Westinghouse Model 44 or 51 steam generators.

The staff reviewed the applicant's Water Chemistry Program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program in SER Section 3.0.3.2.18 and 3.0.3.1.3 respectively and found these programs provide control of contaminants that could cause general, pitting, and crevice corrosion in the steam generator upper and lower shell and transition cone when exposed to secondary feedwater and steam and provides for inspections to detect general, pitting and crevice corrosion. Additionally, the staff found that the provisions of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program are augmented to detect loss of material due to general, pitting, and crevice corrosion in the Unit 2 Model 51 steam generator upper and lower shells and transition cones by visual inspection of the interior circumference of the girth welds each ISI interval.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.2.4 criteria. For those line items that apply to LRA Section 3.4.2.2.2.4, 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).

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, item 1, states that certain aspects of the loss of fracture toughness due to neutron irradiation embrittlement are TLAAs as defined in 10 CFR 54.3 and these TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The applicant further states that there are no TLAAs for the PINGP RPV nozzles because the nozzles will receive fluence less than 10^{17} n/cm^2 (E>1.0 MeV) at 60-years (end of extended period of operation). However, the RPV beltline has TLAAs that include Appendix G of 10 CFR 50 and 10 CFR 50.61. The staff evaluation of loss of fracture toughness due to neutron irradiation embrittlement of the RPV beltline materials is discussed in SER Section 4.2.

SRP-LR Section 3.1.2.2.3, item 1, states that applicants must evaluate the TLAAs in accordance with 10 CFR 54.21(c)(1).

(2) LRA Section 3.1.2.2.3, item 2, states that the loss of fracture toughness aging effect for the PINGP RPV materials is managed by implementing the Reactor Vessel Surveillance Program (RVSP). The PINGP RVSP described in LRA Appendix B2.1.34, is an AMP that includes surveillance capsule removal and specimen mechanical testing/evaluation, radiation analysis, development of P-T limits, and determination of Low-Temperature Overpressure Protection (LTOP) setpoints. The RVSP program ensures that the RPV materials meet the requirements of 10 CFR 50.60 for fracture prevention and the requirements of 10 CFR 50.61 for PTS. The staff evaluation of the PINGP RVSP is discussed in SER Section 3.0.3.2.14.

SRP-LR Section 3.1.2.2.3 states that loss of fracture toughness due to neutron irradiation embrittlement may occur in BWR and PWR reactor vessel beltline shell, nozzle, and welds exposed to reactor coolant and neutron flux. A reactor vessel materials surveillance program monitors neutron irradiation embrittlement of the reactor vessel. Reactor vessel surveillance programs are plant-specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Untested capsules placed in storage must be maintained for future insertion. Thus, further staff evaluation is required for license renewal. Specific recommendations for an acceptable AMP are provided in GALL Report Chapter XI, Section M31.

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 item 1 addresses GALL AMR item IV.A1-10, on the management of cracking in BWR RV flange leakage detection lines. In this section of the LRA, the applicant states that SRP-LR Section 3.1.2.2.4.1 is not applicable to PINGP because this item is applicable to BWR plants only.

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.

This item is not applicable to PINGP because PINGP is a PWR plant and does not have BWR reactor vessel top head enclosure flange leakage detection lines. On this basis, the staff finds that the criteria in SRP-LR 3.1.2.2.4.1 does not apply to PINGP.

(2) LRA Section 3.1.2.2.4 item 2 addresses GALL AMR item IV.C1-4, on the management of cracking due to SCC and/or IGSCC in stainless steel BWR isolation condenser and components. In this section of the LRA, the applicant states that SRP-LR Section 3.1.2.2.4.2 is not applicable to PINGP because this item is applicable to BWR plants only.

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.

This item is not applicable to PINGP because PINGP is a PWR plant and does not have stainless steel BWR isolation condenser and components. On this basis, the staff finds that the criteria in SRP-LR 3.1.2.2.4.2 does not apply to PINGP.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

LRA Section 3.1.2.2.5 indicates crack growth due to cyclic loading associated with underclad cracking of the RV shell is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). SER Section 4.7.2 documents the staff's review of the applicant's evaluation of this TLAA.

3.1.2.2.6 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement and Void Swelling

LRA Section 3.1.2.2.6 addresses the applicant’s evaluation of whether the guidance in SRP-LR Section 3.1.2.2.6 is applicable to the RVI components. In this LRA Section, the applicant identifies that loss of fracture toughness due to neutron irradiation embrittlement and void swelling is applicable to the RVI components as a result of exposing the components to a reactor coolant with neutron flux environment. The applicant’s AMR items in LRA Table 3.1.2-3 indicate that this evaluation is applicable to the following RVI components at PINGP: (1) clevis insert bolts, (2) lower core plate fuel alignment pins, (3) lower support column bolts, (4) lower core plates, (5) lower support columns, (6) lower support forgings, (7) diffuser plates, (8) head cooling spray nozzles, (9) secondary core supports, (10) core baffle and former plates and their fasteners, (11) core barrels and core barrel flanges, (12) core barrel outlet nozzles, and (13) thermal shields. In this LRA section, the applicant states that loss of fracture toughness is an applicable AERM for these components as a result of exposing them to a reactor coolant with integrated neutron flux environment. The applicant states that it credits its PWR Vessel Internals Program to manage loss of fracture toughness of the components as a result of exposing them to a reactor coolant with integrated neutron flux environment. The PWR Vessel Internals Program includes the commitment requested in SRP-LR Section 3.1.2.2.6.

The staff reviewed LRA Section 3.1.2.2.6 against the criteria in SRP-LR Section 3.1.2.2.6 which states that loss of fracture toughness due to neutron irradiation embrittlement and void swelling could occur in stainless steel and nickel alloy RVIs components that are exposed to reactor coolant with an integrated neutron flux environment. This SRP-LR section states that PWR renewal applicants do not need to conduct any additional evaluation of the programs or activities that are used to manage this aging effect if they provide a commitment on their UFSAR Supplement to: (1) participate in the industry programs for investigating and managing aging effects on RVI components; (2) evaluate and implement the results of the industry programs, as applicable to the design of its RVI components; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for RVI components to the NRC for review and approval.

SRP-LR Section 3.1.2.2.6 and AMR items in the GALL Report, Volume 2 for Westinghouse-designed RVI components address loss of fracture toughness for: (1) IV.B2-3 for core baffle and former plates, (2) IV.B2-6 for baffle and former plate screws and bolts, (3) IV.B2-9 for the core barrels, core barrel flanges, core barrel outlet nozzles, and thermal shields, (4) IV.B2-17 for fuel alignment pins, lower support column bolts, and clevis insert bolts in the lower internal assembly, (5) IV.B2-18 for lower core plates, and (6) IV.B2-22 for lower support plate columns and lower support plate forgings or castings in the lower internal assembly. The staff's recommendations for managing loss of fracture toughness in these GALL-based AMR items are the same as those provided in SRP-LR section 3.1.2.2.6.

The applicant credits the AMP B2.1.32 “PWR Vessel Internals Program” to manage loss of fracture toughness for all of the stainless steel (including CASS) and nickel alloy RVI components referenced in GALL AMR items IV.B2-3, IV.B2-6, IV.B2-9, IV.B2-17, IV.B2-18, and IV.B2-22 as being susceptible to the aging mechanisms of neutron irradiation embrittlement and void swelling. The staff verified that Commitment 25 is incorporated in LRA AMP B2.1.32, "PWR Vessel Internals Program," and in LRA UFSAR Section A.2.32, "PWR Vessel Internals Program." The staff also noted that, in this commitment, the applicant committed to performing the following activities for the aging management of RVI components:

- Participate in the industry programs for investigating and managing aging effects on reactor internals;
- Evaluate and implement the results of the industry programs as applicable to the reactor internals; and
- Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

The staff's basis for accepting that LRA Commitment No. 25 is discussed in more detail in SER Section 3.1.2.1.4. In that SER section, the staff provides a detailed basis for demonstrating the applicant's commitment in LRA Commitment No. 25 is in conformance with the staff's aging management recommendations for RVI components in SRP-LR Sections 3.1.2.2.6, 3.1.2.2.9, 3.1.2.2.12, 3.1.2.2.15 and 3.1.2.2.17, and in the GALL AMRs that are associated with these SRP-LR sections. Based on this review, the staff finds that the applicant has provided an acceptable basis for managing loss of fracture toughness due to neutron irradiation embrittlement and void swelling because the applicant's aging management basis and Commitment No. 25 are both in conformance with the staff's recommendations for managing loss of fracture toughness due to neutron irradiation embrittlement and void swelling, as given in SRP-LR Section 3.1.2.2.6 and the GALL AMR items that are associated with the SRP-LR section.

Based on the program identified above and Commitment No. 25, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.6 criteria. For those line items that apply to LRA Section 3.1.2.2.6, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Cracking due to Stress Corrosion Cracking

(1) LRA Section 3.1.2.2.7.1 addresses the applicant's aging management basis for managing cracking due to SCC in the stainless steel flange O-ring leak detection tubes and the BMI guide tubes. The applicant uses RV flange O-ring leak detection tubes as the terminology for its RV flange leak detection lines. The applicant stated that this aging effect/mechanism will be managed with the Water Chemistry Program, alone.

The staff reviewed LRA Section 3.1.2.2.7.1 against the criteria in SRP-LR Section 3.1.2.2.7.1, which states that cracking due to SCC could occur in the PWR stainless steel reactor vessel (RV) flange leak detection lines and bottom-mounted instrument (BMI) guide tubes exposed to reactor coolant. SRP-LR Section 3.1.2.2.7.1, AMR item 23 in Table 1 of the GALL Report Volume 1, and AMR items IV.A2-1 and IV.A2-5 are applicable to the management of cracking due to SCC in PWR BMI guide tubes and PWR reactor vessel flange leakage detection lines. The SRP-LR sections states that for these components, the GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed during the period of extended operation.

The staff noted that the applicant's Water Chemistry Program does not include a component inspection activity to confirm that water chemistry control is adequate to prevent occurrence of the aging effect. In a letter dated December 18, 2008, the staff issued RAI 3.1.2.2.7-01 asking the applicant to include a component inspection activity or to provide a justification for not including one.

The applicant responded to the RAI in a letter dated January 20, 2009. In that letter the applicant revised the LRA to assign the ASME Section XI Inspection, Subsections IWB, IWC, and IWD Program to manage cracking due to SCC in addition to the Water Chemistry Program for the stainless steel BMI guide tubes and fittings exposed to treated water. In addition, the applicant revised the LRA to assign the ASME Section XI Inspection, Subsections IWB, IWC, and IWD Program and the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program to manage cracking due to SCC in addition to the Water Chemistry Program for the stainless steel flange O-ring leak detection tubes, which are the applicant's components that are equivalent to the reactor vessel flange leakage detection lines assessed in the GALL Report. The staff confirmed that in the letter of January 20, 2009, the applicant amended LRA Table 3.1.1, LRA Table 3.1.2-4, and LRA Section 3.1.2.2.7 to incorporate these changes. The applicant stated that with these changes the BMI guide tubes and fittings are inspected in accordance with applicable Examination Categories in ASME Code Section XI, Table IWB-2500-1, and that the stainless steel flange O-ring leak detection tubes receive a one-time volumetric examination of butt weld locations determined to be potentially susceptible to cracking in accordance with the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program.

The staff reviewed the applicant’s RAI response and changes made to the LRA. The staff also reviewed the Water Chemistry Program, the ASME Section XI Inspection, Subsections IWB, IWC, and IWD Program, and the ASME Code Class 1 Small-Bore Piping Program. The staff’s evaluations of those AMPs are documented in SER Section 3.0.3.2.18, Subsection 3.0.3.1.3, and Subsection 3.0.3.1.18, respectively. The staff’s AMP evaluations determined that the Water Chemistry Program provides mitigation for the aging effect of cracking due to SCC in stainless steel components exposed to treated water and that the ASME Section XI Inspection, Subsections IWB, IWC, and IWD Program, and the ASME Code Class 1 Small-Bore Piping Program both provide capability to detect cracking due to SCC.

The staff finds the applicant’s basis for amending the LRA to credit the ASME Section XI Inspection, Subsection IWB, IWC, and IWD Program for management of cracking due to SCC in the stainless steel BMI guide tubes and fittings to be acceptable because of the following: (1) BMI guide tubes are ASME Code Class 1 components, and (2) the ASME Code Section XI includes appropriate Examination Categories for BMI guide tubes. The staff finds the applicant’s proposal to use the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program to detect potential cracking in the stainless steel flange O-ring leak detection tubes to be acceptable because this is consistent with the recommendations in Chapter IV of the GALL Report, Volume 2 that a program corresponding to GALL AMP XI.M35, “One-Time Inspection of ASME Code Class 1 Small Bore Piping,” be used to manage cracking in ASME Code Class 1 small bore piping components.

In addition, since the Water Chemistry Program provides mitigation for the aging effect and the applicant’s proposed inspection programs provide detection of the aging effect, the staff finds the applicant's proposed AMPs to manage the aging effect of cracking due to SCC in the bottom-mounted instrument guide tubes and fittings, and in the flange O-ring leak detection tubes to be acceptable. For these reasons, the staff also finds that the applicant’s response in the letter dated January 20, 2009, resolves all issues raised in RAI AMR-3.1.2.2.7-01 and that the changes made to the LRA in response to this RAI are acceptable.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.1.2.2.7.1 criteria. For those line items that apply to LRA Section 3.1.2.2.7.1, 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).

(2) The applicant states in LRA Section 3.1.2.2.7.2 that cracking due stress corrosion cracking could occur for Class 1 CASS piping, piping components, and piping elements exposed to reactor coolant. LRA Section 3.1.2.2.7.2 further states that 1) this aging effect is managed with a combination of the Water Chemistry Program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program and 2) the

Water Chemistry Program controls concentrations of known detrimental chemical species such as halogens, sulfates and dissolved oxygen below the levels known to cause degradation and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides visual and volumetric examinations of Class 1 CASS piping, piping components, and piping elements exposed to reactor coolant.

The staff reviewed LRA Section 3.1.2.2.7.2 against the criteria in SRP-LR Section 3.1.2.2.7.2, which states that cracking due to SCC could occur in Class 1 PWR CASS reactor coolant system piping, piping components, and piping elements exposed to reactor coolant. The staff noted that the applicant's existing program relies on control of water chemistry to mitigate SCC; however, SCC could occur for CASS components that do not meet the NUREG-0313 guidelines with regard to ferrite and carbon content. The staff reviewed the applicant's Water Chemistry Program in SER Section 3.0.3.2.19 and found this program provides control of contaminants that could cause SCC in Class 1 PWR CASS components. The GALL Report recommends a Water Chemistry Program and, for CASS components that do not meet NUREG-0313, a plant-specific AMP.

SRP-LR Section 3.1.2.2.2.7.2, AMR item 24 in Table 1 of the GALL Report, Volume 1, and GALL AMR item IV.C2-3, are applicable to SCC of CASS Class 1 piping, piping components, and piping elements.

The applicant credits the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to manage SCC in Class 1 PWR CASS components and has not developed a plant-specific program for components that do not meet the provisions of NUREG-0313 with regard to the ferrite and carbon content. The staff noted that in the LRA 3.1.2 Tables, the applicant has assigned "Note E" to several line items for CASS components exposed to a treated water environment. The staff noted that the aging effect of concern is cracking due to SCC for CASS piping, pump casings and valve bodies components, which are addressed in GALL AMR items IV.C2-3 and IV.C2-5. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.1.2.-02 asking the applicant for the following information:

(1) Clarify whether PINGP controls water chemistry in accordance with the guidelines in EPRI Report No. TR-105714, "PWR Primary Water Chemistry Guidelines" for these components.

(2) Clarify how the CASS components in these LRA AMR items meet the SCC susceptibility considerations of having less than a 0.035 percent carbon alloying content or less than a 0.75 percent delta ferrite content.

(3) If it is determined that any of these CASS components do not meet the reduced susceptibility criteria on carbon and delta ferrite alloy contents, discuss the inspection methods that will be used to monitor for cracking in these components. Discuss the flaw evaluation methodologies used by PINGP to account for a change in the critical crack size used in the analysis as a result of a drop in the fracture toughness of the CASS components.

(4) UT methods may be incapable of detecting flaws in CASS components because of the dense, small grain-size microstructure of CASS, which results in significant, high amplitude UT background noise signals. If UT is proposed as the method for inspecting these components, provide your basis why the UT method selected would be capable of distinguishing between a UT signal that results from a flaw in the material as opposed to background UT signals that result from the CASS microstructure or abnormal geometries in the CASS component.

By letter dated January 20, 2009, the applicant responded to RAI 3.1.2-02 stating the following:

(1) The Water Chemistry Program manages cracking due to SCC/IGA of CASS components exposed to a treated water environment by controlling water chemistry in accordance with Revision 5 of the "PWR Primary Water Chemistry Guidelines," EPRI TR-1002884, for primary and auxiliary water systems. EPRI TR-1002884 is a later revision of EPRI Report No. TR-105714.

(2) The carbon alloying and delta ferrite content of the PINGP CASS reactor coolant components is either unknown or typically greater than the 0.035% carbon alloying content and the 7.5% delta ferrite which is discussed in NUREG-1801, item No. IV.C2-3.

(3) The PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program currently provides for volumetric examinations of reactor coolant piping and fittings in accordance with the risk-informed Inservice Inspection Program. ASME Section XI, Examination Category B-L-1 requires VT-1 visual examination of pressure retaining welds in pump casings. Examination Category B-L-2 requires VT-3 visual examination of pump casing internal surfaces, if disassembled. Examination Category B-M-2 requires VT-3 visual examination of internal surfaces of valve bodies, if disassembled. In addition, Examination Category B-P requires visual (VT-2) examination of all pressure retaining piping components.

    Flaws detected in CASS components will be evaluated in accordance with the applicable procedures of ASME Section XI, Subsections IWB-3500 or IWC-3500 under the PINGP ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. Alternatively, flaw tolerance evaluation for components with ferrite content up to 25 percent will be performed according to the principles associated with IWB-3640 procedures for submerged arc welds disregarding the Code restriction of 20% ferrite in IWB-3641(b)(1).

(4) The PINGP procedure for ultrasonic examination of CASS main coolant pipe welds is based on WCAP-11778, "Demonstration of Flaw Detection and Characterization Capabilities for Ultrasonic Examination of Main Coolant Loop Welds," March 1988, prepared by Westinghouse. The report describes the development of improved

manual ultrasonic inspection techniques, and the optimization and qualification of manual ultrasonic flaw detection and characterization capabilities. The WCAP recognized that inspection of heavy-wall austenitic stainless steel components is difficult. However the ultrasonic testing is not impossible if measures include knowledge of fabrication materials to be inspected, adequate surface preparation, knowledge of defects, sufficient training for inspection personnel, improved understanding of the sound beam propagation mechanism, appropriate selection of ultrasonic test equipment, and demonstration of the ultrasonic test procedures. PINGP ultrasonic examination procedures incorporate the research done by WCAP-11778 to improve the ultrasonic inspection of the CASS reactor coolant piping.

The staff finds that chemical species, particularly dissolved oxygen, that could promote SCC of Class 1 PWR CASS components exposed to reactor coolant, are adequately controlled through the applicant's Water Chemistry Program. All CASS components have been identified as susceptible to SCC according to NUREG 0313 and are subject to inspection in accordance with the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

However, the staff noted that UT techniques are not currently capable of differentiating between UT signals that are reflectors from crack-like flaws in CASS and those that result from the complexity of having a large grain boundary structure. The staff noted that UT may not be capable of detecting cracks in these materials through the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program which provides, in part, for ultrasonic examination of CASS main coolant pipe welds. Additionally the staff noted that the applicant can not credit risk-informed ISI for managing aging effects in the period of extended operation because the staff has not approved risk-informed ISI for the fifth and sixth PINGP ISI intervals. In a letter dated February 26, 2009, the applicant stated that during the period of extended operation, should the PINGP IWB, IWC, and IWD Program, with NRC-approved alternatives, require volumetric examinations to be performed per ASME Section XI, Table IWB-2500-1, Examination Category B-J, on the Class 1 CASS main coolant pipe welds, then an ultrasonic examination method qualified under ASME Section XI, Appendix VIII will be an NRC-approved alternative (e.g., enhanced visual examination) will be implemented. The staff finds that the applicant's updated basis for inspecting the CASS RCS piping welds, as clarified in the letter of February 27, 2009, is acceptable because: (1) the applicant will use staff- approved UT methods qualified under ASME Section XI, Appendix VIII for detection of cracking in CASS materials or a staff-approved alternative method (i.e., enhanced visual VT-1 examination) for detecting cracking in these components as a result of SCC/IGA, and (2) this is consistent with the methods for detecting cracks in CASS components, as specified in the "detection of aging effects" program element in GALL AMP, XI.M12. On this basis, the issue raised in RAI 3.1.2.-02 is resolved.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.7.2 criteria. For those line items that apply to LRA Section 3.1.2.2.7.2, 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).

3.1.2.2.8 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 GALL AMR item IV.B1-12, on the management of cracking due to cyclic loading in stainless steel BWR jet pump sensing lines under exposure to the reactor coolant. In this section of the LRA, the applicant states that SRP-LR Section 3.1.2.2.8.1 is not applicable to PINGP because this item is applicable to BWR plants only.

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.

This item is not applicable to PINGP because PINGP is a PWR plant and does not have stainless steel BWR jet pump sensing lines. On this basis, the staff finds that the criteria in SRP-LR 3.1.2.2.8.1 does not apply to PINGP.

(2) LRA Section 3.1.2.2.8 addresses GALL AMR item IV.C1-5, on the management of cracking due to cyclic loading may occur in steel and stainless steel BWR isolation condenser components exposed to reactor coolant. In this section of the LRA, the applicant states that SRP-LR Section 3.1.2.2.8.1 is not applicable to PINGP because this item is applicable to BWR plants only.

SRP-LR Section 3.1.2.2.8 states that cracking due to cyclic loading may occur in steel and stainless steel BWR isolation condenser components exposed to reactor coolant.

The staff noted this item is not applicable to PINGP because PINGP is a PWR plant and does not have stainless steel BWR isolation condenser components. On this basis, the staff finds that the criteria in SRP-LR 3.1.2.2.8.2 does not apply to PINGP.

3.1.2.2.9 Loss of Preload due to Stress Relaxation

LRA Section 3.1.2.2.9 addresses the applicant's evaluation on whether the guidance in SRP-LR Section 3.1.2.2.9 is applicable to the RVI components. In this LRA Section, the applicant identifies that loss of preload due to stress relaxation is applicable to the RVI components as a result of exposing the components to a reactor coolant environment. The applicant's AMR items in LRA Table 3.1.2-3 indicate that this evaluation is applicable to the following RVI components at PINGP: (1) core baffle and former bolts, (2) clevis insert bolts, (3) lower support column bolts in the lower internal assembly, (4) hold-down springs in the upper internals assembly, and (5) upper support column fasteners in the upper internals assembly. In this LRA section, the applicant states that loss of fracture toughness is an applicable AERM for these components exposed to a reactor coolant with integrated neutron flux environment. The applicant states that it credits its PWR Vessel Internals Program to manage loss of fracture toughness of the components as a result of exposing them to a reactor coolant with integrated neutron flux environment.

The staff reviewed LRA Section 3.1.2.2.9 against the criteria in SRP-LR Section 3.1.2.2.9 which states that loss of preload due to stress relaxation could occur in bolted or fastened RVI components that are exposed to the coolant environment. This SRP-LR section states that PWR renewal applicants do not need to conduct any additional evaluation of the programs or activities that are used to manage this aging effect if they provide a commitment on their UFSAR Supplement to: (1) participate in the industry programs for investigating and managing aging effects on RVI components; (2) evaluate and implement the results of the industry programs, as applicable to the design of its RVI components; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for RVI components to the NRC for review and approval.

SRP-LR Section 3.1.2.2.9 and AMR items in the GALL Report, Volume 2 for Westinghouse-designed RVI components address the loss of preload for: (1) IV.B2-5 for core baffle and former bolts, (2) IV.B2-14 for clevis insert bolts, (3) IV.B2-25 for lower support column bolts, (4) IV.B2-33 for hold-down springs in the upper internals assembly, and (5) IV.B2-38 for upper support column bolts. The staff's recommendations for managing loss of preload in these GALL-AMR items are the same as those provided in SRP-LR section 3.1.2.2.9.

The applicant has credited AMP B2.1.32 "PWR Vessels Internal Program" to manage loss of preload due to stress relaxation for all of the RVI bolting and fasteners referenced in GALL AMR items IV.B2-5, IV.B2-14, IV.B2-25, IV.B2-33, and IV.B2-38 identified as being potentially susceptible to the aging mechanism of stress relaxation, including baffle and former plate bolts/fasteners, clevis insert bolts, hold-down springs, lower support column bolts, and upper support column bolts/fasteners. The staff verified that Commitment 25 is incorporated in LRA AMP B2.1.32, "PWR Vessel Internals Program," and in LRA UFSAR Section A.2.32, "PWR Vessel Internals Program." In Commitment No. 25, the applicant committed to performing the following activities for the aging management of RVI components:

- Participate in the industry programs for investigating and managing aging effects on reactor internals;
- Evaluate and implement the results of the industry programs as applicable to the reactor internals; and
- Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

LRA Commitment No. 25 provides an acceptable basis for managing the aging effects that are applicable to RVI components. The commitment is discussed in more detail in SER Section 3.1.2.1.4. Commitment No. 25 is in conformance with the staff's aging management recommendations for RVI components in SRP-LR Sections 3.1.2.2.6, 3.1.2.2.9, 3.1.2.2.12, 3.1.2.2.15 and 3.1.2.2.17, and in the GALL AMRs that are referenced in these SRP-LR sections. Based on its review, the staff finds that the applicant has provided an acceptable basis for managing loss of preload due to stress relaxation in fastened, pinned, keyed, or bolted RVI components because the applicant's aging management basis and the applicant's placement of Commitment No. 25 on the LRA are both in conformance with the staff's recommendations for managing loss of preload due to stress relaxation, as given in SRP-LR Section 3.1.2.2.9 and the GALL AMR items that are referenced by the SRP-LR section.

For those line items that apply to LRA Section 3.1.2.2.9, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.10 Loss of Material Due to Erosion

The staff reviewed LRA Section 3.1.2.2.10 against the criteria in SRP-LR Section 3.1.2.2.10.

LRA Section 3.1.2.2.10 addresses loss of material due to erosion in steel steam generator feedwater impingement plate and support exposed to secondary feedwater. In addition, the LRA states that PINGP steam generators do not have steam generator feedwater impingement plates and supports.

SRP-LR Section 3.1.2.2.10 states that loss of material due to erosion may occur in steel steam generator feedwater impingement plates and supports exposed to secondary feedwater.

The staff reviewed the UFSAR, and verified that PINGP does not have steam generator feedwater impingement plates and supports. On this basis, the staff finds the criteria in SRP-LR Section 3.1.2.2.10 do not apply to PINGP.

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.

SRP-LR Section 3.1.2.2.11 states that cracking due to flow-induced vibration could occur for the BWR stainless steel steam dryers exposed to reactor coolant.

The staff noted that this line item applies to BWR steam dryers and therefore, is not applicable to PINGP because PINGP is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the above, the staff concludes that SRP-LR Section 3.1.2.2.11 criteria do not apply.

3.1.2.2.12 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

LRA Section 3.1.2.2.12 addresses whether cracking due to SCC or IASCC is applicable to the RVI components as result of exposing the components to a reactor coolant environment or a reactor coolant with integrate neutron flux environment. In this LRA section, the applicant states that loss of fracture toughness is an applicable AERM for these components exposed to a reactor coolant with integrated neutron flux environment. The applicant’s AMRs in LRA Table 3.1.2-3 indicate that this evaluation is applicable to the following RVI components at PINGP: (1) core baffle and former plates, (2) core baffle and former plate fasteners, (3) BMI column cruciforms, (4) BMI columns and flux thimble guide tubes, (5) flux thimble tubes, (6) lower support columns, (7) lower support forgings, (8) diffuser plates, (9) head cooling spray nozzles, (10) secondary core supports, (11) rod cluster control assembly (RCCA) guide tubes, (12) upper support columns, (13) upper instrumentation columns, conduits, and supports, (14) hold-down springs, (15) upper core plates, (16) upper support plate assemblies, (17) core barrels and core barrel flanges, (18) core barrel outlet nozzles, and (19) thermal shields. For these components, the applicant states credits the Water Chemistry Program and the PWR Vessel Internals Program to manage cracking of these RVI components as a result of exposing them to a reactor coolant or a reactor coolant with integrated neutron flux environment. The applicant also indicates that the PWR Vessel Internals Program includes the commitment requested in SRP-LR Section 3.1.2.2.12.

The staff reviewed LRA Section 3.1.2.2.12 against the criteria in SRP-LR Section 3.1.2.2.12 which states that cracking due to SCC and IASCC could occur in PWR stainless steel reactor internals exposed to reactor coolant. The existing program relies on control of water chemistry to mitigate these effects. This SRP-LR section states that, although the existing program relies on control of water chemistry for aging management, PWR renewal applicants do not need to conduct any additional evaluation of the programs or activities that are used to manage this aging effect if they provide a commitment in their UFSAR Supplement to: (1) participate in the industry programs for investigating and managing aging effects on RVI components; (2) evaluate and implement the results of the industry programs, as applicable to the design of its RVI components; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for RVI components to the NRC for review and approval.

The guidance in SRP-LR Section 3.1.2.2.12 references the following AMR items in the GALL Report, Volume 2 for Westinghouse-designed RVI components: (1) IV.B2-2 for core baffle and former plates, (2) IV.B2-8 for core barrels, core barrel flanges, core barrel outlet nozzles, and thermal shields, (3) IV.B2-10 for baffle/former bolts and screws, (4) IV.B2-12 for flux thimble guide tubes, (5) IV.B2-24 for lower support casting or forging and lower support plate columns in the lower internal assembly, (6) IV.B2-30 for RCCA guide tubes in the RCCA assembly, (7) IV.B2-36 for upper support columns in the upper internals assembly, and (8) IV.B2-42 for upper support plates, upper core plates, and hold-down springs in the upper internals assembly. The staff's recommendations for managing cracking due to SCC or IASCC in these GALL-based AMR items are the same as those provided in SRP-LR section 3.1.2.2.12.

The applicant credits the AMP B2.1.32 “PWR Vessel Internals Program” for the management of cracking for all of the stainless steel (including CASS) and nickel alloy RVI components referenced in GALL AMR items IV.B2-2, IV.B2-8, IV.B2-10 IV.B2-12, IV.B2-24, IV.B2-30, IV.B2-36, and IV.B2-42 as being susceptible to the aging mechanisms of SCC or IASCC. The staff also confirmed that by letter dated April 13, 2009, the applicant placed LRA Commitment No. 25 on LRA AMP B2.1.32, “PWR Vessels Internals Program and in LRA UFSAR Supplement Section A.2.32, “PWR Vessel Internals Program.” The staff also noted that, in this commitment, the applicant committed to performing the following activities for the aging management of RVI components:

- Participate in the industry programs for investigating and managing aging effects on reactor internals;

- Evaluate and implement the results of the industry programs as applicable to the reactor internals; and
- Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

The staff's basis for accepting that LRA Commitment No. 25 provides an acceptable aging management basis for the aging effects that are applicable to RVI components has been discussed in more detail in SER Section 3.1.2.1.4. In this SER section, the staff provides a detailed basis for concluding that the applicant's commitment in LRA Commitment No. 25 is in conformance with the staff's aging management recommendations for RVI components in SRP-LR Sections 3.1.2.2.6, 3.1.2.2.9, 3.1.2.2.12, 3.1.2.2.15 and 3.1.2.2.17, and in the GALL AMRs that are referenced in these SRP-LR sections. Based on that review, the staff finds that the applicant has provided an acceptable basis for managing cracking due to SCC or IASCC because the applicant's aging management basis and the applicant's placement of Commitment No. 25 on the LRA are both in conformance with the staff's recommendations for managing cracking due to SCC or IASCC, as given in SRP-LR Section 3.1.2.2.12 and the GALL AMR items that are referenced by the SRP-LR section.

Based on the programs identified above and Commitment No. 25, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.12 criteria. For those line items that apply to LRA Section 3.1.2.2.12, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.13 Cracking Due to Primary Water Stress Corrosion Cracking

The applicant states in LRA Section 3.1.2.2.13 that cracking due to PWSCC could occur for nickel alloy reactor internals components. LRA Section 3.1.2.2.13 further states that this aging effect is managed with a combination of the Water Chemistry Program, the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program and the Nickel-Alloy Nozzles and Penetrations Program. For the Nickel-Alloy Nozzles and Penetrations Program, PINGP commits to the following activities for managing the aging of nickel-alloy components susceptible to PWSCC: (1) comply with applicable NRC orders, and (2); implement applicable NRC Bulletins, Generic Letters, and staff-accepted industry guidelines. The staff noted that SRP-LR 3.1.2.2.13 (which is the SRP-LR section that corresponds to LRA Section 3.1.2.2.13) is related to management of PWSCC in ASME code Class 1 nickel alloy piping, piping components, piping elements and reactor vessel components and attachments (other than the upper reactor vessel closure head nozzles and welds) made from nickel alloy. This SRP-LR section does not apply to RVI components made from nickel alloy. In a letter dated February 26, 2009 the applicant stated that the further evaluation of cracking due to PWSCC contained in LRA Section 3.1.2.2.13 incorrectly refers to this aging effect/mechanism occurring in RVIs components. The associated Table 1 Item Number 3.1.1-31 is used in LRA Table 3.1.2-1, Pressurizer System – Summary of Aging Management Evaluation, and Table 3.1.2-4, Reactor Vessel System – Summary of Aging Management Evaluation. Therefore this further evaluation should refer to this aging effect/mechanism occurring in pressurizer and reactor vessel components. The first sentence of LRA Section 3.1.2.2.13 is hereby deleted and replaced with the following: cracking due to primary water stress corrosion cracking could occur for nickel alloy pressurizer and reactor vessel components. The staff noted that this response corrects the error in the LRA.

The staff reviewed LRA Section 3.1.2.2.13 against the criteria in SRP-LR Section 3.1.2.2.13, which states that cracking due to PWSCC could occur in PWR components made of nickel alloy and steel with nickel alloy cladding, including reactor coolant pressure boundary components and penetrations inside the RCS such as pressurizer heater sheathes and sleeves, nozzles, and other internal components. With the exception of reactor vessel upper head nozzles and penetrations, the GALL Report recommends ASME Section XI ISI (for Class 1 components) and control of water chemistry. SRP-LR Section 3.1.2.2.13 further states that for nickel alloy components, no further aging management review is necessary if the applicant complies with applicable NRC Orders and provides a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.

SRP-LR Section 3.1.2.2.2.13, AMR item 31 in Table 1 of the GALL Report, Volume 1, and GALL AMR items IV.C2-13 and IV.C2-24, are applicable to PWSCC of nickel alloy and steel with nickel-alloy cladding piping, piping components, piping elements, penetrations, nozzles, safe ends, and welds (other than reactor vessel head) and core support pads.

The staff reviewed the applicant's Water Chemistry Program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program in SER Sections 3.0.3.2.18 and 3.0.3.1.3 respectively and found these programs provide control of contaminants that could promote PWSCC and provides inspection to detect PWSCC in nickel-alloy components. The staff reviewed the applicant's Nickel-Alloy Nozzles and Penetrations Program, B2.1.27 in SER Section 3.0.3.3.1 and finds that the applicant has met the criteria of SRP-LR Section 3.1.2.2.13, because the applicant has committed (Commitment No. 21) to implement NRC Bulletins and Generic Letters and industry guidelines to manage PWSCC of RCS components fabricated with nickel alloys including base metals and welds as part of LRA AMP B2.1.27. However, a revision to 10 CFR 50.55a, "Codes and Standards" was issued September 2008 which requires all licensees of PWRs to augment their ISI programs to implement ASME Code Case N-722, which provides for additional detection capability for partial or full penetration welds in Class1 components fabricated with Alloy 600/82/182 material for pressure boundary leakage in PWR plants. The applicant's LRA does not address the new provisions of 10 CFR 50.55a because it was submitted January 2008. The staff noted that the applicant committed (Commitment No.1) to submit amendments to the PINGP LRA including UFSAR supplements pursuant to 10 CFR 54.21(b), Contents of application--technical information, (b) that states "CLB changes during NRC review of the application. Each year following submittal of the LRA and at least three months before scheduled completion of the NRC review, an amendment to the renewal application must be submitted that identifies any change to the CLB of the facility that materially affects the contents of the LRA, including the FSAR supplement." Based on the applicant's Commitment No.1, the staff finds the applicant will implement the new mandated augmented inspection requirements in 10 CFR 50.55a(g)(6)(ii)(E).

The staff noted that the original version of the applicant's Nickel-Alloy Nozzles and Penetration Program indicated that the program will comply with all NRC Orders Generic Letters, and

Bulletins related to PWSCC of nickel-alloys, and that the applicant reflected these activities as an LRA enhancement that is defined in LRA Commitment No. 21.

The staff also noted that in its March 27, 2009 letter, the applicant amended AMP B2.1.27, Nickel-Alloy Nozzles and Penetrations Program, to redefine the program as an existing plant-specific AMP for the LRA that incorporates the ten program elements for AMPs, as recommended in SRP-LR Appendix A, Section A.1.2.3, and to delete the commitment in the previous version of the AMP and in Commitment No. 21 from the scope of the LRA.

The staff evaluated the amended Nickel-Alloy Nozzles and Penetrations Program and the plant-specific program elements for this AMP in SER Section 3.0.3.3.1 and found that this program will manage PWSCC during the period of extended operation because the program elements meet the criteria of SRP-LR, Appendix A.1.2.3.

The staff concluded that commitment 21 is no longer necessary because the AMP is now based on the new augmented inspection requirements for those nickel alloy components. Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.13 criteria, as amended in LRA Section 3.1.2.2.13 to account for the new augmented inspection requirements that are mandated for these components in 10 CFR 50.55a(g)(6)(ii)(E). For those line items that apply to LRA Section 3.1.2.2.13, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.14 Wall Thinning Due to Flow-Accelerated Corrosion

LRA Section 3.1.2.2.14 addresses wall thinning due to FAC. The applicant states that the PINGP SG feedwater inlet rings and supports do not perform a License Renewal intended function. The applicant states that the inlet rings are not safety-related and are located above the tube bundle wrapper transition cone roof and are therefore isolated from impacting the U-tubes.

The staff reviewed LRA Section 3.1.2.2.14 against the criteria in SRP Section 3.1.2.2.14, which states that wall thinning due to FAC, may occur in steel FW inlet rings and supports. The GALL Report references NRC Information Notice (IN) 91-19, "Steam Generator Feedwater Distribution Piping Damage," for evidence of FAC in steam generators and recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting wall thinning of the SG feedwater inlet rings and supports as a result of FAC.

SRP-LR Section 3.1.2.2.14, the AMR item 32 in Table 1 of the GALL Report, Volume 1 and AMR item IVD1-26 of the GALL Report, Volume 2 are applicable management of wall thinning due to FAC in steel with feedwater inlet ring and support that are exposed to a secondary feedwater/steam environment. For this line item, the GALL Report recommends a plant-specific program to be evaluated.

The staff reviewed UFSAR Section 4.3.2.1.1, and verified that feedwater to the steam generator, enters just above the top of the U-tubes through a feedwater ring. The water flows downward through an annulus between the tube wrapper and the shell and then upward through the tube bundle where part of it is converted to steam. On the basis that feedwater inlet rings and supports are not within the scope of 10 CFR 54.21(a)(1), (2) or (3), and therefore, not included in the scope of license renewal, the staff finds that Table 3.1.1, item 3.1.1-32 is not applicable.

3.1.2.2.15 Changes in Dimensions Due to Void Swelling

LRA Section 3.1.2.2.15, the applicant identifies that changes in dimension due to void swelling is applicable to the RVI components as a result of exposing the components to a reactor coolant environment or a reactor coolant with integrated neutron flux environment. The applicant's AMR items in LRA Table 3.1.2-3 indicate that this evaluation is applicable to the following RVI components at PINGP: (1) core baffle and former plates, (2) core baffle and former plate fasteners, (3) core barrels, core barrel flanges, and thermal shields, (4) BMI columns and flux thimble guide tubes, (5) flux thimble tubes, (6) lower core plate fuel alignment pins, lower support column bolts, and clevis insert bolts, (7) lower core plates, radial keys, and clevis inserts, (8) lower support columns and lower support forgings, (9) diffuser plates, (10) head cooling spray nozzles, (11) secondary core supports, (12) RCCA guide tube pins and fasteners, (13) RCCA guide tubes, (14) upper support columns, (15) upper instrumentation columns, conduits, and supports, (16) upper core plate alignment keys, upper core plate fuel alignment pins, and upper supper column fasteners in the upper internals assembly, (17) head and vessel alignment pins, and (18) upper support plates, upper core plates, and hold-down springs in the upper internals assembly. For these components, the applicant identifies that changes in dimension due to void swelling is an applicable AERM as a result of exposure of the components to the reactor coolant with integrated neutron flux environment. The applicant states that it credits its PWR Vessel Internals Program to manage changes in dimension that may occur in these RVI components as a result of exposing them to the reactor coolant with integrated neutron flux environment.

The staff reviewed LRA Section 3.1.2.2.15 against the criteria in SRP-LR Section 3.1.2.2.15, which states that changes in dimensions due to void swelling could occur in stainless steel and nickel alloy PWR reactor internal components that are exposed to the reactor coolant environment. This SRP-LR section states (from the GALL Report) that PWR renewal applicants do not need to conduct any additional evaluation of the programs or activities that are used to manage this aging effect if they provide a commitment on their UFSAR Supplement to the: (1) participate in the industry programs for investigating and managing aging effects on RVI components; (2) evaluate and implement the results of the industry programs, as applicable to the design of its RVI components; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for RVI components to the NRC for review and approval.

The guidance in SRP-LR Section 3.1.2.2.15 and the following AMR items in the GALL Report, Volume 2 for Westinghouse-designed RVI components are applicable to managing changes in dimension due to void swelling: (1) IV.B2-1 for core baffle and former plates, (2) IV.B2-4 for core baffle and former bolts, (3) IV.B2-7 for core barrels, core barrel flanges, core barrel outlet nozzles, and thermal shields, (4) IV.B2-11 for flux thimble guide tubes, (5) IV.B2-15 for fuel alignment pings, lower support plate column bolts, and clevis insert bolts, (6) IV.B2-19 for lower core plate radial keys and clevis inserts, (7) IV.B2-23 for lower support castings or forgings and for lower support plate columns in the lower internal assembly, (8) IV.B2-27 for RCCA guide tube bolts and RCCA guide tube support pins, (9) IV.B2-29 for RCCA guide tubes in the RCCA assembly, (10) IV.B2-35 for upper support columns in the upper internals assembly, (11) IV.B2-39 for upper support column bolts, upper core plate alignment pins, and fuel alignment pins in the upper internal assembly, and (12) IV.B2-41 for upper support plates, upper core plates, and hold-down springs in the upper internals assembly. The staff's recommendations for managing changes in dimension due to void swelling in these GALL-based AMR items are the same as those provided in SRP-LR section 3.1.2.2.15.

The staff noted that the applicant has credited the AMP B2.1.32 "PWR Vessel Internals Program" for the management of changes in dimension for all of the stainless steel (including CASS) and nickel alloy RVI components referenced in GALL AMR items IV.B2-1, IV.B2-4, IV.B2-7, IV.B2-11, IV.B2-15, IV.B2-19, IV.B2-23, IV.B2-27, IV.B2-29, IV.B2-35, and IV.B2-39 as being susceptible to mechanism of void swelling. The staff also noted that the applicant is conservatively crediting this AMP for the management of changes in dimension due to void swelling of the flux thimble tubes, diffuser plates, head cooling spray nozzles, secondary core supports, upper instrumentation columns, conduits, and supports, and head and vessel alignment pins, even though the GALL Report does not include any generic AMR items for management of void swelling in these components. The staff confirmed that, in a letter dated April 11, 2008, the applicant placed LRA Commitment No.25 on LRA AMP B2.1.32, "PWR Vessels Internals Program and on LRA UFSAR Supplement Section A.2.32, "PWR Vessel Internals Program," and credited this commitment for aging management of changes in dimensions as a result of potential void swelling of the components. In this commitment, the applicant committed to performing the following activities for the aging management of RVI components:

- Participate in the industry programs for investigating and managing aging effects on reactor internals;
- Evaluate and implement the results of the industry programs as applicable to the reactor internals; and
- Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

The staff's basis for accepting LRA Commitment No. 25 is discussed in more detail in SER Section 3.1.2.1.4. In that SER section, the staff provides a detailed basis for concluding that the applicant's commitment in LRA Commitment No. 25 is in conformance with the staff's aging management recommendations for RVI components in SRP-LR Sections 3.1.2.2.6, 3.1.2.2.9, 3.1.2.2.12, 3.1.2.2.15 and 3.1.2.2.17, and in the GALL AMRs that are associated with these SRP-LR sections. Based on this review, the staff finds that the applicant has provided an acceptable basis for managing changes in dimension due to void swelling because the applicant's aging management basis and Commitment No. 25 on the LRA are in conformance with the staff's recommendations for managing changes in dimension due to void swelling, as given in SRP-LR Section 3.1.2.2.15 and the applicable GALL AMR items.

Based on the program identified above and Commitment No.25, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.15 criteria. For those line items that apply to

LRA Section 3.1.2.2.15, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.16 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

(1) The applicant states in LRA Section 3.1.2.2.16.1 that cracking due to stress corrosion cracking could occur for stainless steel CRDM rod travel housings. LRA Section 3.1.2.2.16.1 further states that this aging effect is managed with a combination of the Water Chemistry Program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. The Water Chemistry Program controls concentrations of known detrimental chemical species such as chlorides, fluorides, sulfates and dissolved oxygen below the levels known to cause degradation. The applicant further stated that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program includes periodic visual, surface, and/or volumetric examination of Class 1, 2, and 3 pressure-retaining components, their welded integral attachments, and bolting. The program also provides component repair and replacement requirements in accordance with ASME Section XI.

The staff reviewed LRA Section 3.1.2.2.16.1 against the criteria in SRP-LR Section 3.1.2.2.16.1 which states that cracking due to SCC could 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. SRP-LR Section 3.1.2.2.16.1 further states that cracking due to PWSCC could 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. SRP-LR Section 3.1.2.2.16.1 states that the GALL Report recommends ASME Section XI ISI and control of water chemistry to manage this aging and recommends no further aging management review for PWSCC of nickel alloy if the applicant complies with applicable NRC Orders and provides a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.

SRP-LR Section 3.1.2.2.2.16.1 is associated with AMR item 34 in Table 1 of the GALL Report, Volume 1, and GALL AMR item IV.2-11, and is applicable to SCC of stainless steel reactor control rod drive head penetration, pressure housings.

The only Unit 1 and Unit 2 components that apply to this category are fabricated with stainless steel. Therefore, the commitment recommended in the GALL Report is not required. The staff reviewed the applicant's Water Chemistry Program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program in SER Sections 3.03.2.18 and 3.0.3.1.3 respectively, and found those programs provide control of contaminants that could promote SCC and provides inspection to detect PWSCC in stainless steel components. On that basis, the staff finds that the applicant's aging management basis acceptable.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.16.1 criteria. For those line items that apply to LRA Section 3.4.2.2.16.1, 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 functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

(2) LRA Section 3.1.2.2.16.2 addresses the applicant's aging management basis for managing cracking due to SCC in the stainless steel pressurizer spray heads. The applicant stated that this aging effect/mechanism will be managed with a combination of the Water Chemistry Program and the One-Time Inspection Program.

The staff reviewed LRA Section 3.1.2.2.16.2 against the criteria in SRP-LR Section 3.1.2.2.16.2, which states that cracking due to SCC could occur in stainless steel pressurizer spray heads and that cracking due to PWSCC could occur in nickel-alloy pressurizer spray heads. The SRP-LR states that the existing program relies on control of water chemistry to mitigate this aging effect, and for stainless steel pressurizer spray heads the GALL Report recommends one-time inspection to confirm that cracking is not occurring. SRP-LR Section 3.1.2.2.16.2, AMR item 36 in Table 1 of the GALL Report Volume 1, and AMR item IV.C2-17 in Table IV.C2 of the GALL Report Volume 2, are applicable to the management of cracking due to SCC in stainless steel (including CASS) and nickel alloy pressurizer spray heads. The staff's aging management guidance and recommendations in the AMR items are the same as those provided in SRP-LR Section 3.1.2.2.16.2.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.19, found that the Water Chemistry Program, provides mitigation for cracking due to SCC in stainless steel components. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the One-Time Inspection Program is adequate to detect the presence or note the absence of cracking due to SCC for components within its scope. The staff confirmed that the applicant is crediting the AMPs recommended in GALL AMR item IV.C2-17, that is the Water Chemistry Program provides mitigation for the identified age-related degradation, and that the One-Time Inspection Program provides verification of the effectiveness of the Water Chemistry Program to mitigate cracking due to SCC or PWSCC for the CASS pressurizer spray heads exposed to treated water. The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.1.2.2.16.2 and in GALL AMR item IV.C2-17.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.16.2 criteria. For those line items that apply to LRA Section 3.1.2.2.16.2, 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).

3.1.2.2.17 Cracking Due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

LRA Section 3.1.2.2.17 identifies that cracking due to SCC, PWSCC, and IASCC is an applicable AERM for the stainless steel and nickel alloy RVI components that are exposed to a reactor coolant with neutron flux environment. The applicant's AMRs in LRA Table 3.1.2-3 indicate that this evaluation is applicable to the following RVI components at PINGP: (1) clevis insert bolts, (2) lower core plate fuel alignment pins, (3) lower support column bolts, (4) lower core plates, (5) radial support keys, (6) clevis inserts, (7) RCCA guide tube fasteners, (8) RCCA guide tube pins, (9) upper core plate alignment keys, (10) upper core plate fuel alignment pins, and (11) upper support column fasteners. For these AMRs items, the applicant credits its Water Chemistry Program and the PWR Vessel Internals Program to manage cracking to SCC, PWSCC, and IASCC in the components. The applicant states that its PWR Vessel Internals Program includes the commitment in SRP-LR Section 3.1.2.2.17.

The staff reviewed LRA Section 3.1.2.2.17 against the criteria in SRP-LR Section 3.1.2.2.17, which states that cracking due to SCC, PWSCC, and IASCC could occur in PWR stainless steel and nickel alloy RVI components. The SRP-LR section identifies that the existing program relies on control of water chemistry to mitigate these effects, but qualifies this recommendation by adding that the existing program should be augmented to manage these aging effects for RVIs components. This SRP-LR section states that, to address this issue, the GALL Report recommends no further aging management review if the applicant provides a commitment in the UFSAR Supplement to do the following: (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

The staff noted that the guidance in SRP-LR Section 3.1.2.2.17 and the following AMR items in the GALL Report, Volume 2 for Westinghouse-designed RVI components are applicable to managing cracking due to SCC, PWSCC, and IASCC: (1) IV.B2-16 for clevis insert bolts, lower core plate fuel alignment pins, lower support column bolts, (2) IV.B2-20 for lower core plates, radial support keys, and clevis inserts, (3) IV.B2-28 for RCCA guide tube fasteners and RCCA guide tube pins, and (4) IV.B2-40 for upper core plate alignment keys, upper core plate fuel alignment pins, and upper support column fasteners. The staff's recommendations for managing cracking due to SCC, PWSCC, or IASCC in these components are the same as those provided in SRP-LR Section 3.1.2.2.17.

The staff noted that the applicant has credited the AMP B2.1.32 "PWR Vessel Internals Program" for the management of cracking for all of the stainless steel (including CASS) and nickel alloy RVI components referenced in GALL AMR items IV.B2-16, IV.B2-20, IV.B2-28, and IV.B2-40 as being susceptible to the aging mechanisms of SCC. PWSCC, or IASCC. The staff also confirmed that by letter dated April 13, 2009, the applicant placed LRA Commitment No. 25 in LRA AMP B2.1.32, "PWR Vessels Internals Program and on LRA UFSAR Supplement Section A.2.32, "PWR Vessel Internals Program." In this Commitment, the applicant committed to performing the following activities for the aging management of RVI components:

- Participate in the industry programs for investigating and managing aging effects on reactor internals;
- Evaluate and implement the results of the industry programs as applicable to the reactor internals; and
- Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.

The staff's basis for accepting that LRA Commitment No. 25 is discussed in more detail in SER Section 3.1.2.1.4. In that SER section, the staff provides a detailed basis for concluding that the applicant's that Commitment No. 25 is in conformance with the staff's aging management recommendations for RVI components in SRP-LR Sections 3.1.2.2.6, 3.1.2.2.9, 3.1.2.2.12, 3.1.2.2.15 and 3.1.2.2.17, and in the applicable GALL AMRs. Based on this review, the staff finds that the applicant has provided an acceptable basis for managing cracking due to SCC, PWSCC, and IASCC because the applicant's aging management basis and the applicant's placement of Commitment No. 25 on the LRA are both in conformance with the staff's recommendations for managing cracking due to these aging mechanisms, as given in SRP-LR Section 3.1.2.2.17 and the applicable GALL AMR items.

Based on the program identified above and Commitment No. 25, the staff concludes that the applicant's programs meet the SRP-LR Section 3.1.2.2.17 criteria. For those line items that apply to LRA Section 3.1.2.2.17, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.1.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.1.2-1 through 3.1.2-5, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.1.2-1 through 3.1.2-5, the applicant indicated, via Notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.1.2.3.1 Pressurizer System - Summary of Aging Management Review – LRA Table 3.1.2-1

The staff reviewed LRA Table 3.1.2-1, which summarizes the results of AMR evaluations for the pressurizer system component groups. The staff determined that all AMR evaluation results in LRA Table 3.1.2-1 are consistent with the GALL Report.

3.1.2.3.2 Reactor Vessel, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation - Reactor Coolant System - LRA Table 3.1.2-2

The staff reviewed LRA Table 3.1.2-2, which summarizes the results of AMRs for reactor coolant system component groups.

LRA Table 3.1.2-2, the applicant proposed to manage cumulative fatigue damage-fatigue in CASS reactor coolant pump (RCP) casings and piping/fittings in a treated water (interior) environment by using TLAA. The staff reviewed the applicant's proposal and documented its findings in SER sections 4.3.1.5 and 4.3.1.6.

In LRA Table 3.1.2-2, the applicant proposed to manage loss of material - selective leaching in copper alloy piping and fittings; cast iron filters and strainer housings; and bronze valve bodies in an interior environment of lubricating oil by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for these line items indicating that the aging effect is not in the GALL Report for these components, material, and environment combination. The applicant also referenced a plant-specific note (118), which stated that for these line items loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil internal environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The One-Time Inspection Program credited under the applicant's Selective Leaching Program is consistent with the One-Time Inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. Table IX.C in the GALL Report Volume 2 identifies that copper alloys with greater than 15% alloying zinc content, aluminum bronzes with greater than 8% Al alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15% alloying zinc contents may be susceptible to selective leaching, and the basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective

Leaching Programs is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3 Reactor Internals System - Summary of Aging Management Review – LRA Table 3.1.2-3

The staff reviewed LRA Table 3.1.2-3, which summarizes the results of AMR evaluations for the reactor internals system component groups. The staff determined that all AMR evaluation results in LRA Table 3.1.2-3 are consistent with the GALL Report.

3.1.2.3.4 Reactor Vessel System - Summary of Aging Management Review – LRA Table 3.1.2-4

The staff reviewed LRA Table 3.1.2-4, which summarizes the results of AMR evaluations for the reactor vessel system component groups. The staff determined that all AMR evaluation results in LRA Table 3.1.2-4 are consistent with the GALL Report.

3.1.2.3.5 Steam Generator System - Summary of Aging Management Review – LRA Table 3.1.2-5

The staff reviewed LRA Table 3.1.2-5, which summarizes the results of AMRs for the steam generator system component groups.

In LRA Table 3.1.2-5, the applicant proposed to manage heat transfer degradation due to fouling for nickel alloy U-tubes in the steam generator exposed to an environment of treated water using the Water Chemistry Program alone. The applicant cited 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 in GALL Volume 2, line item V.A-16, for heat exchanger tubes, where the material is stainless steel, the environment is treated water, and the aging effect is reduction of heat transfer due to fouling, the recommended AMPs are Water Chemistry and One-Time Inspection. The staff also noted that the applicant did not provide any discussion in the LRA to explain why a confirmation of water chemistry effectiveness is not needed for this component, material, environment and aging effect combination. In a letter dated December 18, 2008, the staff issued RAI 3.1.2-5-01, asking the applicant to provide a program for confirmation of water chemistry effectiveness or to provide a technical justification why such a confirmation is not needed.

The applicant responded to the RAI in a letter dated January 20, 2009. In that letter the applicant stated that the One-Time Inspection Program will be used to verify effectiveness of the Water Chemistry Program on the external side of the steam generator U-tubes where the environment is non-borated treated water. The applicant also stated, with technical justification, that an inspection activity to confirm effectiveness of the Water Chemistry Program to mitigate loss of heat transfer due to fouling is not needed on the internal side of the steam generator U-tubes where the environment is borated treated water.

In its response letter, the applicant revised LRA Table 3.1.2-5 AMR results for Unit 1 and Unit 2 U-tubes made of nickel alloy in a treated water (external) environment (non-borated demineralized water) and with an aging effect of heat transfer degradation due to fouling. For these AMR results, the applicant revised the LRA table to show that aging management is done with a combination of the Water Chemistry Program and the One-Time Inspection Program.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program, provides mitigation for loss of heat transfer due to fouling in nickel-alloy components. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the One-Time Inspection Program is adequate to detect the presence or the absence of fouling which may cause loss of heat transfer for components within its scope. Based on the staff's determination that the Water Chemistry Program provides mitigation and the One-Time Inspection Program provides detection for the aging effect of loss of heat transfer due to fouling, the staff finds the applicant's proposed AMPs for managing the aging effect of loss of heat transfer due to fouling in the nickel-alloy steam generator U-tubes exposed to non-borated treated water (external) to be acceptable.

In its response letter, the applicant justified not providing an inspection on the internal (primary) side of the U-tubes by reference to the GALL Report, Section IX.D, Environments, in which the discussion of treated water environment states that the PWR reactor coolant environment (treated borated water) contains a recognized corrosion inhibitor. In addition, the applicant referenced SRP-LR Table 3.1-1, item 83 which indicates that the staff has found Water Chemistry, alone, to be adequate for managing loss of material due to corrosion in stainless steel and nickel alloy pressure boundary components exposed to borated treated water. The applicant stated that fouling on the reactor coolant side of the steam generator U-tubes would occur only through the buildup of corrosion products, and since the GALL Report and the SRP-LR credit only Water Chemistry for management of loss of material due to corrosion, verification of the effectiveness of the Water Chemistry Program to mitigate loss of heat transfer due to fouling on the primary (internal) side of the steam generator U-tubes is not required.

The staff reviewed the applicant's technical justification and compared it with sections of the GALL Report and the SRP-LR cited by the applicant. The staff noted that the references cited by the applicant state that the Water Chemistry Program, alone, provides adequate aging management for loss of material due to corrosion in a borated treated water environment, and confirmation of water chemistry effectiveness is not specified for this environment. In addition, the staff noted that on the primary side of the steam generator tubes, the dissolved oxygen level is monitored and controlled to reduce potential for oxidation, which provides added assurance that corrosion products cannot buildup on the primary side of the steam generator U-tubes. On the basis that the GALL Report and the SRP-LR state that the Water Chemistry Program, alone, is adequate to prevent loss of material due to corrosion in a borated treated water environment, and because buildup of corrosion products is the only identified age-related mechanism that could lead to fouling on the primary side of the steam generator U-tubes, the staff finds the applicant's technical justification to be acceptable. On this basis, the staff finds the Water Chemistry Program, alone, to provide adequate management for the aging effect of loss of heat transfer due to fouling on the primary (internal) side of the steam generator U-tubes.

On the basis described above, the staff finds that the applicant's response resolves all issues raised in RAI AMR-3.1.2-5-01. The staff also finds the applicant's proposed AMPs for managing the aging effect of loss of heat transfer due to fouling in the nickel-alloy steam generator U-tubes 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the reactor vessel, 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 the following:

- containment spray system
- residual heat removal system
- safety injection system

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides AMR results for the ESF systems components and component groups. LRA Table 3.2.1, "Summary of Aging Management Evaluations in Chapter V of NUREG-1801 for Engineered Safety Features," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the ESF 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 CRs 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 ESF systems components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted a review of the AMR items that the applicant had identified as being consistent with the GALL Report 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.

The staff also conducted a review of 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 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 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 PINGP (See SER Section 3.2.2.2.2)
Stainless steel containment isolation piping and components internal surfaces exposed to treated water (3.2.1-3)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.2.2.2.3.(1))
Stainless steel piping, piping components, and piping elements exposed to soil (3.2.1-4)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.2.3.(2))
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.2.1-5)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable (See SER Section 3.2.2.2.3.(3))

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.2.1-6)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.2.2.2.3.(4))
Partially encased stainless steel tanks with breached moisture barrier exposed to raw water (3.2.1-7)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.2.3.(5))
Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal) (3.2.1-8)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.2.3.(6))
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.2.1-9)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	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	Water Chemistry Program (B2.1.40).	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	Not applicable	Not applicable to PWRs (See SER Section 3.2.2.2.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel high-pressure safety injection (charging) pump minflow 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 PINGP (See SER Section 3.2.2.2.6)
Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal) (3.2.1-13)	Loss of material due to general corrosion and fouling	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.2.2.2.7)
Steel piping, piping components, and piping elements exposed to treated water (3.2.1-14)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.2.2.2.8(1))
Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water (3.2.1-15)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.2.2.2.8.(2))
Steel piping, piping components, and piping elements exposed to lubricating oil (3.2.1-16)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.29)	Consistent with GALL Report (See SER Section 3.2.2.2.8.(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 (with or without coating or wrapping) piping, piping components, and piping elements buried in soil (3.2.1-17)	Loss of material due to general, pitting, crevice, and micro biologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.2.9)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.2.1-18)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Not applicable to PWRs
Steel piping, piping components, and piping elements exposed to steam or treated water (3.2.1-19)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Not applicable	Not applicable to PWRs
Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated or unborated) > 250°C (> 482°F) (3.2.1-20)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable	Not applicable to PWRs
High-strength steel closure bolting exposed to air with steam or water leakage (3.2.1-21)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Steel closure bolting exposed to air with steam or water leakage (3.2.1-22)	Loss of material due to general corrosion	Bolting Integrity	No	Not applicable	Addressed in line item 3.2.1-23 (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 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 (B2.1.6)	Consistent with GALL Report
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.2.1-24)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B2.1.6)	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 stress corrosion cracking	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.2.1-26)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Steel heat exchanger components exposed to closed cycle cooling water (3.2.1-27)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water (3.2.1-28)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.2.1-29)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.2.1-30)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external) (3.2.1-31)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring Program (B2.1.14)	Consistent with GALL Report
Steel piping and ducting components and internal surfaces exposed to air - indoor uncontrolled (Internal) (3.2.1-32)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Steel encapsulation components exposed to air - indoor uncontrolled (internal) (3.2.1-33)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Addressed in item 3.2.1-46 (See SER Section 3.2.2.1.1)
Steel piping, piping components, and piping elements exposed to condensation (internal) (3.2.1-34)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Not applicable to PINGP (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 containment isolation piping and components internal surfaces exposed to raw water (3.2.1-35)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Steel heat exchanger components exposed to raw water (3.2.1-36)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.2.1-37)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Stainless steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-38)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Stainless steel heat exchanger components exposed to raw water (3.2.1-39)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water (3.2.1-40)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (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
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 of Materials Program (B2.1.36)	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 of Materials Program (B2.1.36)	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 PINGP (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 PINGP (See SER Section 3.2.2.1.1)
Aluminum, copper alloy > 15% Zn, and steel external surfaces, bolting, and piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-45)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion Program (B2.1.7)	Consistent with GALL Report
Steel encapsulation components exposed to air with borated water leakage (internal) (3.2.1-46)	Loss of material due to general, pitting, crevice and boric acid corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.23)	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
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 PINGP (See SER Section 3.2.2.1.1)
Stainless steel or stainless-steel-clad steel piping, piping components, piping elements, and tanks (including safety injection tanks/accumulators) exposed to treated borated water > 60°C (> 140°F) (3.2.1-48)	Cracking due to stress corrosion cracking	Water Chemistry	No	Water Chemistry Program (B2.1.40)	Consistent with GALL Report
Stainless steel piping, piping components, piping elements, and tanks exposed to treated borated water (3.2.1-49)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Program (B2.1.40)	Consistent with GALL Report
Aluminum piping, piping components, and piping elements exposed to air - indoor uncontrolled (internal/external) (3.2.1-50)	None	None	NA	None	Consistent with GALL Report
Galvanized steel ducting exposed to air - indoor controlled (external) (3.2.1-51)	None	None	NA	None	Not applicable to PINGP (See SER Section 3.2.2.1.1)
Glass piping elements exposed to air - indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water (3.2.1-52)	None	None	NA	None	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.2.1-53)	None	None	NA	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.2.1-54)	None	None	NA	None	Not applicable to PINGP (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	NA	None	Not applicable to PINGP (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	NA	None	Consistent with GALL Report
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-57)	None	None	NA	None	Consistent with GALL Report for stainless steel components See item 3.2.1-45 for cooper alloy < 15% Zn components

The staff's review of the ESF systems component groups followed any one of several approaches. One approach, documented in SER Section 3.2.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.2.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.2.2.3, reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the ESF systems components is documented in SER Section 3.0.3.

3.2.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.2.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the ESF systems components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed-Cycle Cooling Water System Program
- External Surfaces Monitoring Program
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Lubricating Oil Analysis Program
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program
- One-Time Inspection Program
- Selective Leaching of Materials Program
- Water Chemistry Program

LRA Tables 3.2.2-1 through 3.2.2-3 summarize AMRs for the ESF systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with Notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the 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 determined were in need of additional clarification and assessment. The staff's evaluations of these AMRs are provided in the subsections that follows.

3.2.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.2.1, items 18-20, the applicant states that the corresponding AMR items in GALL Report are not applicable to PINPG because the AMR items in the GALL Report are only applicable to particular components in BWR reactor designs and because PINGP is a Westinghouse-designed PWR facility. The staff verified that the stated AMR items in the GALL Report are only applicable to BWR designed facilities and are not applicable to the PINGP LRA.

In LRA Table 3.2.1, item 21, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP does not have high strength closure bolting in the ESF Systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP does not have high strength closure bolting 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 PINGP.

In LRA Table 3.2.1, item 22, the applicant states that the corresponding AMR result line in the GALL Report is not used at PINGP. In addition, the LRA states to see line item 3.2.1-23 for further discussion. The staff noted that the aging effect and component type for item 3.2.1-23 include the aging effect and component type for item 3.2.1-22. In addition, the applicant manages the components with the same AMP recommended by GALL Report for item 3.2.1-23. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

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 PINGP has no in-scope steel piping exposed to closed-cycle cooling water in the ESF Systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP has no in-scope steel piping exposed to closed-cycle cooling 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 PINGP.

In LRA Table 3.2.1, items 32-40, 43, 44, 47, 51, and 54, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because PINGP does not have the component, material, and environment combination in the ESF Systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP does not have the component, material, and environment combination 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 PINGP.

In LRA Table 3.2.1, item 55, the applicant states that further evaluation in LRA Section 3.5.2.2.1.4 concluded that steel components in concrete are not susceptible to aging and do not requiring aging management. The staff noted this item applies to GALL line item V.F-14 and V.F-17, which indicate that there is no aging effect for this component type and environment, and therefore do not require an AMP. Therefore, the staff agrees with the applicant in that this line item does not require aging management.

3.2.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.2.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the ESF systems components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to cladding breach
- loss of material due to pitting and crevice corrosion

- reduction of heat transfer due to fouling
- hardening and loss of strength due to elastomer degradation
- 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

LRA Section 3.2.2.2.2 provides the applicant's corresponding aging management basis for managing loss of material due to cladding breach for steel pump casings with stainless steel cladding exposed to treated borated water. In this section of the LRA, the applicant identified this line item as not applicable because PINGP does not have steel with stainless steel cladding pump casings exposed to treated borated water. The charging pumps at PINGP are fabricated from stainless steel.

The staff reviewed LRA Section 3.2.2.2.2 against the criteria in SRP-LR Section 3.2.2.2.2 which 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 and recommends further evaluation of a plant-specific AMP to ensure that aging effect is managed.

SRP-LR Section 3.2.2.2.2, AMR item 2 in Table 2 of the GALL Report, Volume 1, and AMR item V.D1-32 of the GALL Report, Volume 2 address management of loss of material due to cladding in steel with stainless steel cladding pump casings that are exposed to a treated borated water environment.

The staff reviewed LRA AMR Tables 3.2.2-1, 3.2.2-2, and 3.2.2-3 for the containment spray, residual heat removal, and high pressure safety injection (HPSI) systems and determined that the pump casings in these systems are fabricated from stainless steel materials. The staff also determined that the applicant has addressed loss of material for these pump casings in Table 3.2.1, line item 3.2.1-49, and in the AMR item on page 3.2-28 for stainless steel containment spray pump casings that the applicant has aligned to GALL AMR item V.A-27, and the AMR items on pages 3.2-38 for CASS RHR pump casings and 3.2-47 for stainless steel HPSI pump casings that the applicant has aligned to GALL AMR item V.D1-30. The staff evaluates these AMR items in SER Section 3.2.2.1. On the basis that PINGP does not have steel pump casings with stainless steel cladding exposed to treated borated water, and because the stainless steel pump casings are included in other lines for aging management, the staff finds that this line item is not applicable to PINGP.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

(1) LRA Section 3.2.2.2.3.1 addresses the applicant's aging management basis for managing loss of material due to pitting and crevice corrosion in stainless steel containment isolation piping and components internal surfaces exposed to treated water. In the LRA the applicant stated that the aging effect is managed by a combination of the Water Chemistry Program and the One-Time Inspection Program.

The staff reviewed LRA Section 3.2.2.2.3.1 against the criteria in SRP-LR Section 3.2.2.2.3.1, which states that loss of material due to pitting and crevice corrosion may occur for internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. The SRP-LR states that the existing AMP relies on monitoring and control of water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. The GALL Report recommends further evaluation of programs to verify the effectiveness of the chemistry control program.

SRP-LR Section 3.2.2.2.3.1, AMR item 3 in Table 2 of the GALL Report, Volume 1, and GALL AMR item V.C-4, are applicable to stainless steel containment isolation piping and components internal surfaces exposed to treated water in the containment isolation components group. GALL item V.C-4 recommends aging management using the Water Chemistry and One-Time Inspection Programs. The applicant's AMR result applies for stainless steel piping, fittings and valve bodies in the containment spray system.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.19, found that the Water Chemistry Program provides mitigation for loss of material due to crevice and pitting corrosion in stainless steel components. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the One-Time Inspection Program is adequate to detect the presence or note the absence of loss of material due to pitting and crevice corrosion for components within its scope. The staff confirmed 1) that the applicant is crediting the AMPs recommended in GALL AMR item V.C-4, 2) that the Water Chemistry Program provides mitigation for the identified age-related degradation, and 3) that the One-Time Inspection Program provides verification of the effectiveness of the Water Chemistry Program to mitigate loss of material due to pitting or crevice corrosion in stainless steel piping and piping components exposed to treated water. The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.2.2.2.3.1 and in GALL AMR item V.C-4.

Based on the programs identified, the staff concludes that the applicant's proposed programs are acceptable for managing the aging effects in the applicable components. 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).

(2) LRA Section 3.2.2.2.3.2 and in Table 3.2.1, AMR item 3.2.1-4 state that PINGP does not have stainless steel piping, piping components, and piping elements exposed to soil in NUREG-1801 Chapter V systems.

The staff reviewed LRA Section 3.2.2.2.3.2 against criteria of SRP-LR Section 3.2.2.2.3.2, which states that loss of material from pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil.

The staff reviewed the documentation supporting the applicant's LRA, LRA scoping results, and license renewal drawings, and confirmed the applicant's claim that PINGP does not have stainless steel piping, piping components, and piping elements exposed to soil. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.3.2 criteria do not apply.

(3) In LRA Section 3.2.2.2.3.3 and in Table 3.2.1, AMR item 3.2.1-5, the applicant stated that the item is applicable for BWRs only.

The staff reviewed LRA Section 3.2.2.2.3.3 against criteria of SRP-LR Section 3.2.2.2.3.3, which states that loss of material due to pitting and crevice corrosion may occur for BWR stainless steel and aluminum piping, piping components, and piping elements exposed to treated water.

SRP-LR Section 3.2.2.2.3.3, AMR item 5 in Table 2 of the GALL Report, Volume 1, and GALL AMR items V.D2-19 and V.D2-28 are applicable for aluminum or stainless steel piping and piping components exposed to treated water in BWR emergency core cooling systems.

On the basis that the applicant's reactor is a PWR, not a BWR, the staff finds that the applicant has provided an acceptable basis for concluding the staff's guidance for aluminum or stainless steel piping and piping components exposed to treated water in BWR emergency core cooling systems, as given in SRP-LR Section 3.2.2.2.3.3, AMR item 5 in Table 2 of the GALL Report, Volume 1, and GALL AMR items V.D2-19 and V.D2-28 is not applicable to the LRA.

(4) The applicant stated in LRA Section 3.2.2.2.3.4 that loss of material due to pitting and crevice corrosion could occur in stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. LRA Section 3.2.2.2.3.4 further states that this aging effect is managed with a combination of the Lubricating Oil

Analysis Program and the One-Time Inspection Program. The Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results to maintain contaminants (primarily water and particulates) within acceptable limits and the One-Time Inspection Program provides for inspections that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.2.2.2.3.4 against the criteria in SRP-LR Section 3.2.2.2.3.4 which states that loss of material from pitting and crevice corrosion could occur for stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. SRP-LR Section 3.2.2.2.3.4 further states that the existing program relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits and the effectiveness of lubricating oil control should be verified with a one-time inspection of selected components at susceptible locations.

SRP-LR Section 3.2.2.2.3.4, AMR item 6 in Table 2 of the GALL Report, Volume 1, and GALL AMR item V.D1-18 (Emergency Core Cooling System) are applicable to loss of material due to pitting and crevice corrosion of stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. These components are identified in LRA Table 3.2.2-3, "Heat Exchanger Tubes."

The staff reviewed LRA Appendix B, Sections B2.1.24, "Lubricating Oil Analysis" and B2.1.29, "One-Time Inspection" in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively, and found that these programs provide periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material and will perform one-time inspections of select stainless steel and copper alloy components exposed to lubricating oil for loss of material due to pitting and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program in applicable ESF systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item V.D1-18, and is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.2.2.2.3.4.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.3.4 criteria. For those line items that apply to LRA Section 3.2.2.2.3.4, 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).

(5) LRA Section 3.2.2.2.3.5 and in Table 3.2.1, AMR item 3.2.1-7 state that PINGP does not have stainless steel tanks with breached moisture barrier exposed to raw water in NUREG-1801 Chapter V systems.

The staff reviewed LRA Section 3.2.2.2.3.5 against criteria of SRP-LR Section 3.2.2.2.3.5, which states that loss of material from pitting and crevice corrosion could occur for partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering.

The staff reviewed the documentation supporting the applicant's LRA, LRA scoping results, and license renewal drawings, and confirmed the applicant's claim that PINGP does not have stainless steel tanks with a breached moisture barrier 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 PINGP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.3.5 criteria do not apply.

(6) LRA Section 3.2.2.2.3.6 addresses the applicant’s aging management basis for managing loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, piping elements and tank internal surfaces exposed to internal condensation in the ESF. The applicant stated there are no stainless steel piping and piping components exposed to condensation in the GALL Report, Chapter V (ESF) systems.

The staff compared LRA Section 3.2.2.2.3.6 against the criteria in SRP-LR Section 3.2.2.2.3.6, which states that loss of material due to pitting and crevice corrosion may occur for stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

SRP-LR Section 3.2.2.2.3.6, AMR item 8 in Table 2 of the GALL Report, Volume 1, and GALL AMR items V.A-26 and VD.1-29, are applicable for stainless steel piping, piping components, piping elements internal surfaces and tanks in the containment spray and emergency core cooling systems.

The staff noted that the containment spray system includes 6 inch diameter stainless steel pipe that normally is exposed (internally) to primary containment air between containment spray heads and the normally-closed flow control valve. The staff also noted that the emergency core cooling systems include partially filled stainless steel tanks exposed to treated water. The staff could find no basis in the LRA explaining why these components would not experience internal condensation. In a letter dated December 18, 2008, the staff issued RAI 3.2.2.2.3.6-01 asking the applicant to provide its basis for saying that there are no stainless steel piping and piping components exposed to internal condensation in the ESF systems and to clarify whether there are any stainless steel tanks in the ESF systems exposed to internal condensation.

The applicant responded to the RAI in a letter dated January 20, 2009. In that letter the applicant provided the following discussion:

> The containment spray system spray nozzles and selected piping were assigned an internal environment of primary containment air (internal). These components are completely within the auxiliary building and containment. The auxiliary building indoor areas are protected from weather and have an ambient temperature range between 60 ºF to 125 ºF. The containment indoor areas are protected from weather and have an ambient temperature range between 50ºF to 120ºF. The internal air/gas environment of the containment spray system piping and nozzles is at the same temperature as the surrounding room temperature such that condensation is not expected.
>
> The partially filled stainless steel tanks in the safety injection system are the refueling water storage tanks and the reactor coolant safety injection accumulators. These tanks are completely contained within the auxiliary building and containment, respectively. The auxiliary building indoor areas are protected from weather and have an ambient temperature range between 60ºF to 125ºF. The containment indoor areas are protected from weather and have an ambient temperature range between 50ºF to 120ºF. The internal fluid environment and internal air/gas environment of these tanks are at the same temperature as the surrounding room temperature such that condensation is not expected. If a portion of a component was exposed to fluid, then typically the component was conservatively assumed to be fully exposed to the fluid environment for performing the aging management evaluations.

The staff noted the applicant’s statements that for containment spray system nozzles and piping and for partially filled stainless steel tanks in the auxiliary and containment buildings the internal air/gas and internal fluid environments of these components are at the same temperature as the surrounding room temperature. On the basis that there is no difference between the ambient temperature of these components and the temperature of the internal air/gas environment, and because a component temperature cooler than the internal air/gas environment would be needed for condensation to occur, the staff finds the applicant’s explanation to be acceptable and to resolve the issues raised in RAI 3.2.2.2.3.6-01.

Based on the applicant’s response to RAI 3.2.2.2.3.6-01, the staff finds that LRA Table 3.2.1, AMR item 3.2.1-8, and the staff’s guidance in SRP-LR Section 3.2.2.2.3.6, AMR item 8 in the GALL Report, Volume 1, and GALL AMR items V.A-26 and VD.1-26 are not applicable to the LRA because the corresponding component, material and environment combination does not exist in ESF systems at the PINGP. RAI 3.2.2.2.3.6-1 is resolved.

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

(1) The applicant stated in LRA Section 3.2.2.2.4.1 that reduction of heat transfer due to fouling could occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. LRA Section 3.2.2.2.4.1 further states that that this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program. The Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results to maintain oil systems contaminants (primarily water and particulates) within acceptable limits and the One-Time Inspection Program performs sampling inspections that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.2.2.2.4.1 against the criteria in SRP-LR Section 3.2.2.2.4.1 which states that reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. SRP-LR Section 3.2.2.2.4.1 further states that the existing AMP relies on monitoring and control of lube oil chemistry to mitigate reduction of heat transfer due to fouling, the effectiveness of lube oil chemistry control should be verified to ensure that fouling is not occurring, and a one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly.

SRP-LR Section 3.2.2.2.4.1, AMR item 9 in Table 2 of the GALL Report, Volume 1, and GALL AMR item V.D1-8 (Emergency Core Cooling System) are applicable to reduction of heat transfer due to fouling of steel, stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil. These components are identified in LRA Table 3.2.2-3: Heat Exchanger Tubes.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively. The staff found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude fouling and 2) will perform one-time inspections of select stainless steel and copper alloy heat exchanger tubing exposed to lubricating oil for loss of heat transfer due to fouling to verify the effectiveness of the Lubricating Oil Analysis Program in applicable ESF systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item V.D1-8 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.2.2.2.4.1.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.4.1 criteria. For those line items that apply to LRA Section 3.2.2.2.4.1, 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).

(2) LRA Section 3.2.2.2.4.2 addresses the applicant's aging management basis for managing reduction of heat transfer due to fouling in stainless steel heat exchanger tubes exposed to treated water. The applicant stated that the aging effect is managed with the Water Chemistry Program, alone. The applicant stated that the One-Time Inspection Program is not required to verify the water chemistry effectiveness for a borated treated water environment.

The staff reviewed LRA Section 3.2.2.2.4.2 against the criteria in SRP-LR Section 3.2.2.2.4.2, which states that reduction of heat transfer due to fouling may occur for stainless steel heat exchanger tubes exposed to treated water. The SRP-LR states that the existing program relies on control of water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may have been inadequate. Therefore, the GALL Report recommends that the effectiveness of the chemistry control program should be verified to ensure that reduction of heat transfer due to fouling is not occurring and that the component's intended function will be maintained during the period of extended operation.

SRP-LR Section 3.2.2.2.4.2, AMR item 10 in Table 2 of the GALL Report, Volume 1, and GALL AMR item V.A-16 are applicable to stainless steel heat exchanger tubes exposed to treated water in the containment spray system. GALL item V.A-16 recommends aging management using the Water Chemistry and One-Time Inspection Programs for components exposed to un-borated treated water.

The staff noted that the applicant included stainless steel heat exchanger tubes exposed to treated borated water in the reactor coolant system (LRA page 3.1-57), the containment spray system (LRA page 3.2-25), the residual heat removal system (LRA page 3.2-36), and the safety injection system (LRA page 3.2-43) in the AMR evaluation; and the applicant cited generic Note E indicating that the AMR result is consistent with the GALL Report for material, environment, and aging effect, but a different AMP is credited.

In a letter dated December 18, 2008 the staff issued RAI 3.2.2.2.4.2-01 asking the applicant to identify the heat exchangers included in this evaluation and to provide a technical justification for not including a verification of Water Chemistry Program effectiveness as recommended in the SRP-LR and the GALL Report.

The applicant responded to the RAI in a letter dated January 20, 2009. The applicant identified the heat exchangers as the reactor coolant pump thermal barrier heat exchanger, the containment spray pump seal cooler, the residual heat removal heat exchanger, the residual heat removal pump seal water cooler, and the safety injection pump seal water cooler. In that letter the applicant referred to the GALL Report, Section

IX.D, and the discussion of a treated water environment therein. In that discussion, the GALL Report states that treated, borated water contains a known corrosion inhibitor. The applicant also referred to GALL Report Section IX.F, which describes fouling as an accumulation of deposits that may be due to biofouling or particulate fouling, such as sediment, silt or corrosion products. The applicant also stated that fouling of the heat exchanger tubes on the treated water side would occur only through the buildup of corrosion products because there is no source for biofouling or other particulate buildup. The applicant stated that because borated treated water contains a corrosion inhibitor, fouling due to a buildup of corrosion products will not occur in an environment of borated, treated water.

The staff reviewed GALL Sections IX.D and IX.F, which were referenced in the applicant's response. The staff noted that in GALL Section IX.D, treated water is described, in general, as demineralized water. However, the discussion in the GALL Report also states that treated water may include corrosion inhibitors and that the PWR reactor coolant environment includes boron, which is a recognized corrosion inhibitor. The staff also reviewed additional AMR results in the GALL Report (items V.A-27, V.A-28, and V.D1-30) where the material is stainless steel and the environment is explicitly identified as treated borated water. The staff noted that for a treated borated water environment the GALL Report recommends that the Water Chemistry Program, alone, provides adequate management for the aging effect of loss of material due to pitting and crevice corrosion in stainless steel components. Because the GALL Report states that in a treated borated water environment the Water Chemistry program, alone, provides adequate aging management for loss of material due to corrosion in stainless steel components, and because the only source for fouling of the stainless steel heat exchanger tubes is corrosion products, the staff finds that the applicant's response resolves all issues raised in RAI AMR-3.2.2.2.4.2-01.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program provides adequate control of boron content for treated borated water and mitigation for loss of material due to crevice and pitting corrosion in stainless steel components. The staff confirmed that the Water Chemistry Program is a mitigative AMP that is consistent with the AMP recommended in GALL item V.A-16; that in an environment of treated borated water, augmentation of the Water Chemistry Program is not needed to confirm that the program effectively prevents loss of material due to pitting or crevice corrosion in stainless steel components; and that because loss of material due to corrosion does not occur in the heat exchanger tubes, there is no source of material to cause fouling in the stainless steel heat exchanger tubes and examination is not required to confirm that fouling does not occur. The staff finds the applicant's AMR results acceptable because the applicant is crediting the Water Chemistry Program for aging management consistent with the SRP-LR recommendations and because the boron in the treated water environment creates an effective corrosion inhibitor such that a One-Time Inspection of the components is not necessary. This is consistent with the aging management recommendation in GALL AMR item V.D1-30.

Based on the programs identified, the staff concludes that the applicant's proposed programs are acceptable for managing the aging effects in the applicable components.

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 states that hardening and loss of strength due to elastomer degradation, is not applicable to PINGP, a PWR plant.

SRP-LR Section 3.2.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of the BWR standby gas treatment system ductwork and filters exposed to uncontrolled indoor air.

The staff noted that PINGP is a PWR plant and does not have BWR standby gas treatment system ductwork and filters. Therefore, this aging effect is not applicable to PINGP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.5 criteria do not apply.

3.2.2.2.6 Loss of Material Due to Erosion

LRA Section 3.2.2.2.6 addresses the applicant's aging management basis for managing loss of material due to erosion in the stainless steel HPSI pump miniflow recirculation orifice exposed to treated borated water. In the LRA the applicant stated that this AMR result line AMR item 3.2.1-12 is not applicable because safety injection pumps are not used for normal charging.

The staff reviewed LRA Section 3.2.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6, which states loss of material due to erosion may occur in the stainless steel HPSI pump miniflow recirculation orifice exposed to treated borated water. The GALL Report recommends a plant-specific AMR be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging.

SRP-LR Section 3.2.2.2.6, AMR item 12 in Table 2 of the GALL Report, Volume 1, and GALL AMR item V.D1-14, are applicable for the stainless steel miniflow recirculation orifice exposed to treated borated water in the emergency core cooling system. The GALL Report references Licensee Event Report (LER) 50-275/94-023 for evidence of erosion and recommends further evaluation to ensure that the aging effect is adequately managed.

The staff noted that the description of the AMP for GALL AMR item V.D.1-14 states that erosion of the orifice is due to extended use of the centrifugal HPSI pump for normal charging. The staff also reviewed LER 50-275/94-023 and noted that the OE described therein is related to a system in which a selected HPSI pump was normally used for charging and is constantly in operation, resulting in constant flow through the miniflow orifice.

The staff reviewed the description of the applicant's safety injection system in the UFSAR (Prairie Island Updated Safety Analysis Report, Revision 29, Section 6.2, Safety Injection

System) and confirmed that the applicant's safety injection system is designed so that HPSI pumps are not required for normal charging, and under normal standby conditions there is no flow through the HPSI pump miniflow recirculation orifice. Since the applicant's HPSI pumps are not used for normal charging and normally there is no flow through the HPSI miniflow recirculation orifice, there is no mechanism to cause loss of material due to erosion. Because there is no mechanism to cause loss of material due to erosion in the HPSI pumps' miniflow orifices, the staff finds that the applicant has provided an acceptable basis for concluding that Table 3.2.1, AMR item number 3.2.1-12, and the staff guidance in SRP-LR Section 3.2.2.2.6, AMR item 12 in Table 2 of the GALL Report, Volume 1, and GALL AMR item V.D1-14 are not applicable to the LRA.

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 states that loss of material due to general corrosion and fouling on steel BWR drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to indoor uncontrolled air is not applicable to PINGP, a PWR plant.

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 indoor uncontrolled air and may cause plugging of the spray nozzles and flow orifices.

The staff noted that PINGP is a PWR plant and does not have steel drywell and suppression chamber spray system. Therefore, this aging effect is not applicable to PINGP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.7 criteria do not apply.

3.2.2.2.8 Loss of Material Due to General, Pitting, and Crevice Corrosion

(1) LRA Section 3.2.2.2.8.1 and in Table 3.2.1, AMR item 3.2.1-14, the applicant stated that loss of material due to general, pitting and crevice corrosion could occur for BWR steel piping, piping components, and piping elements exposed water is not applicable to PINGP, a PWR plant.

    SRP-LR Section 3.2.2.2.8.1 states that loss of material due to general, pitting and crevice corrosion could occur for BWR steel piping, piping components, and piping elements exposed to water.

    The staff noted that PINGP is a PWR plant and does not have BWR steel piping, piping components, and piping elements. Therefore, this aging effect is not applicable to PINGP.

    Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.8.1 criteria do not apply.

(2) LRA Section 3.2.2.2.8.2 addresses the applicant's aging management basis for managing loss of material due to general, pitting and crevice corrosion in steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water. The applicant stated that for these components the aging effects will be managed with a combination of the Water Chemistry Program and the One-Time Inspection Program. The applicant also listed loss of material due to galvanic corrosion as a potential aging effect for this material and environment combination to be managed by the Water Chemistry Program and the One-Time Inspection Program and cited plant-specific Note 210 stating that galvanic corrosion is also included.

The staff reviewed LRA Section 3.2.2.2.8.2 against the criteria in SRP-LR Section 3.2.2.2.8.2, which 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 SRP-LR states that 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.

SRP-LR Section 3.2.2.2.8.2, AMR item 15 in Table 2 of the GALL Report, Volume 1, and GALL AMR item V.C-6, are applicable for steel containment isolation piping and components internal surfaces exposed to treated water in the containment isolation components group. GALL item V.C-6 recommends aging management using the Water Chemistry and One-Time Inspection programs. The applicant's AMR result applies for carbon steel and ductile iron components exposed to treated water in the containment spray system.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program provides mitigation for loss of material due to general, crevice, pitting and galvanic corrosion in steel components. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the One-Time Inspection Program is adequate to detect the presence or note the absence of loss of material due to general, pitting, crevice, and galvanic corrosion for components within its scope. The staff confirmed that the applicant is crediting the AMPs recommended in GALL AMR item V.C-6, that the Water Chemistry Program provides mitigation for the identified age-related degradation, and that the One-Time Inspection Program provides verification of the effectiveness of the Water Chemistry Program to mitigate loss of material due to general, pitting or crevice corrosion in steel or ductile iron piping and piping components exposed to treated water. The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.2.2.2.8.2 and in GALL AMR item V.C-6.

Based on the programs identified, the staff concludes that the applicant's proposed programs are acceptable for managing the aging effects in the applicable components.

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) The applicant states in LRA Section 3.2.2.2.8.3 that loss of material due to general, pitting, and crevice corrosion could occur in steel piping, piping components, and piping elements exposed to lubricating oil. LRA Section 3.2.2.2.8.3 further states that this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program. The Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results to maintain contaminants (primarily water and particulates) within acceptable limits. The One-Time Inspection Program provides for inspections that either verify that unacceptable degradation is not occurring or trigger additional actions if unacceptable degradation is identified.

SRP-LR Section 3.2.2.2.8.3 states that, loss of material due to general, pitting and crevice corrosion could occur for steel piping, piping components, and piping elements exposed to lubricating oil. The existing program relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. The GALL Report recommends further evaluation to verify the effectiveness of the lubricating oil program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring.

SRP-LR Section 3.2.2.2.8.3, AMR item 16 in Table 3 of the GALL Report, Volume 1, and GALL AMR item V.D1-28 (Emergency Core Cooling System), are applicable to loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to lubricating oil. These components are identified in LRA, Table 3.2.2-3: Piping / Fittings, Thermowells, and Valve Bodies.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively. The staff found that these programs provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material and will perform one-time inspections of select steel and components exposed to lubricating oil for loss of material due to general, pitting and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program in applicable ESF systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item V.D1-28 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.2.2.2.8.3.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.2.2.2.8.3 criteria. For those line items that apply to LRA

Section 3.2.2.2.8, the staff finds that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 states that loss of material due to general, pitting, crevice, and MIC in steel piping (with or without coating or wrapping), piping components, and piping elements buried in soil is not applicable because there are no buried carbon steel components in ESF systems with intended functions for license renewal at PINGP.

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.

The staff reviewed the documentation supporting the applicant's LRA, LRA scoping results, and license renewal drawings, and confirmed the applicant's claim that PINGP does not have any steel piping, piping components, and piping elements that are exposed to a soil environment. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.9 criteria do not apply.

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 3.2.2-3, 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 3.2.2-1 through 3.2.2-3, the applicant indicated, via Notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.2.2.3.1 Containment Spray System - Summary of Aging Management Review – LRA Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes the results of AMR evaluations for the containment spray system component groups. The staff determined that all AMR evaluation results in LRA Table 3.2.2-1 are consistent with the GALL Report.

3.2.2.3.2 Residual Heat Removal System - Summary of Aging Management Review – LRA Table 3.2.2-2

The staff reviewed LRA Table 3.2.2-2, which summarizes the results of AMR evaluations for the residual heat removal system component groups. The staff determined that all AMR evaluation results in LRA Table 3.2.2-2 are consistent with the GALL Report.

3.2.2.3.3 Safety Injection System - Summary of Aging Management Review – LRA Table 3.2.2-3

In LRA Table 3.2.2-3, the applicant proposed to manage changes in material properties due to ozone and ultraviolet exposure and cracking due to ozone and ultraviolet exposure for safety injection system (SI) piping and fittings fabricated from polyvinyl chloride (PVC) that are exposed to an external uncontrolled plant indoor air environment. The applicant's AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment. For the PVC components in these AMR items, the applicant credits PINGP AMP B2.1.14 "External Surfaces Monitoring Program" to manage cracking in the components and changes in material properties of the PVC materials.

The staff noted that the applicant has proposed to enhance the scope of "External Surfaces Program" to include non-metallic components, including PVC, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for the aging effect of loss of material. The staff determined that additional information was needed on the applicant's proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008 the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008. The staff's evaluation of the applicant's response is documented in SER Sections 3.0.3.2.5 and includes the staff's basis for resolving the issue raised in RAI B2.1.14-1. The staff's evaluation of PINGP's response to RAI B2.1.14-1 in SER Section 3.0.3.25 also includes the staff's basis for concluding the visual examination methods for elastomer (rubber), thermoplastic, or thermoset polymer materials need to be coupled to physical manipulation methods in order to accomplish effective management of cracking or material property changes of these types of materials.

The staff verified that applicant's program includes periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff also verified that the applicant has amended its program to supplement the program's visual examination methods for elastomer (rubber), thermoplastic, or thermoset polymer materials with physical manipulation techniques that will be used to aid the visual inspections in detecting cracking in the components or identifying any changes in the material properties of component materials (e.g., changes in the elastic, hardness or strength properties of the materials). On the basis that periodic visual inspections will be coupled to physical manipulation techniques and will be performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program to be acceptable for these types of component materials.

In LRA Table 3.2.2-3, the applicant proposed to manage loss of material-selective leaching in brass heat exchanger components and copper alloy heat exchanger tubes in an internal environment of lubricating oil by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for these line items indicating that the aging effect is not in the GALL Report for these components, material, and environment combinations. The applicant also referenced a plant-specific note, which stated that for these line items loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant's Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that the GALL Report Table IX.C identifies that copper alloys with greater than 15% alloying zinc content, aluminum bronzes with greater than 8% aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy and brass heat exchanger components because the basis is consistent with: (1) GALL Table IX.C, which identifies that copper alloys with greater than 15% alloying zinc contents may be susceptible to selective leaching, and (2) GALL AMP XI.M33 which includes an acceptable program for managing loss of material in for copper alloy, brass, aluminum bronze and cast iron components as a result of selective leaching.

LRA Table 3.2.2-3 summarizes the results of AMRs for the Safety Injection System piping and fittings constructed out of PVC and exposed to treated water (internal). The applicant proposed no aging effect and therefore that no AMP is required.

The applicant has indicated that generic Note F is applicable for these items with plant-specific note 213. Generic Note F is “Material not in NUREG-1801 for this component.” Plant-specific note 213 states, “Materials science evaluation for this material in this environment results in no aging effects." 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 PVC has no aging effect when in contact with treated water (Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956.)

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 Aging Management of Auxiliary Systems

This section of the SER documents the staff’s review of the applicant’s AMR results for the auxiliary systems components and component groups of:

- auxiliary and radwaste area ventilation system
- chemical and volume control system
- component cooling system
- containment hydrogen control system
- control room and miscellaneous area ventilation system
- cooling water system
- diesel generator and screenhouse ventilation system
- diesel generators and support system
- fire protection system
- fuel oil system
- heating system
- miscellaneous gas system
- plant sample system
- primary containment ventilation system
- radiation monitoring system
- spent fuel pool cooling system
- station and instrument air system
- steam exclusion system
- turbine and administration building ventilation system
- waste disposal system
- water treatment system

3.3.1 Summary of Technical Information in the Application

LRA Section 3.3 provides AMR results for the auxiliary systems components and component groups. LRA Table 3.3.1, "Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the auxiliary systems components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry OE in the determination of AERMs. The plant-specific evaluation included CRs 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 a review of the AMR items that the applicant had identified as being consistent with the GALL Report to confirm the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's review evaluation are documented in SER Section 3.3.2.1.

The staff also conducted a review of 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, AMRs that are 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 that 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 System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel cranes - structural girders exposed to air - indoor uncontrolled (external) (3.3.1-1)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the SRP-LR, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1)	Yes	TLAA	Consistent with GALL Report (See SER Section 3.3.2.2.1)
Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air - indoor uncontrolled, treated borated water or treated water (3.3.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report (See SER Section 3.3.2.2.1)
Stainless steel heat exchanger tubes exposed to treated water (3.3.1-3)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.2)
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution > 60°C (> 140°F) (3.3.1-4)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.3.1)
Stainless steel and stainless clad steel heat exchanger components exposed to treated water > 60°C (> 140°F) (3.3.1-5)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.3.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-6)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.3.3)
Stainless steel non-regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-7)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (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 stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (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 stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL (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 stress corrosion cracking, cyclic loading	Bolting Integrity. The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.3.2.2.4.4)
Elastomer seals and components exposed to air - indoor uncontrolled (internal/external) (3.3.1-11)	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated	Yes	External Surfaces Monitoring Program (B2.1.14)	Consistent with GALL Report (See SER Section 3.3.2.2.5.1)
Elastomer lining exposed to treated water or treated borated water (3.3.1-12)	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PINGP (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	Not applicable	Not applicable to PINGP (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 (B2.1.24), One-Time Inspection Program (B2.1.29)	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	Lubricating Oil Analysis Program (B2.1.24), One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (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 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	Lubricating Oil Analysis Program (B2.1.24), One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.3.2.2.7.1)
Steel piping, piping components, and piping elements exposed to treated water (3.3.1-17)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.7.2)
Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-18)	Loss of material/general (steel only), pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.7.3**)**
Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil (3.3.1-19)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Buried Piping and Tanks Inspection Program (B2.1.8)	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 microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes	Fuel Oil Chemistry Program (B2.1.19), One-Time Inspection Program (B2.1.29)	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 micro biologically influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.3.2.2.9.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated water (3.3.1-22)	Loss of material due to pitting and crevice corrosion (only for steel after lining/cladding degradation)	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.3.2.2.10.1)
Stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water (3.3.1-23)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.10.2)
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.3.1-24)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PINGP (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	External Surfaces Monitoring Program (B2.1.14)	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 (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.3.2.2.10.4)
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	Compressed Air Monitoring Program (B2.1.10)	Consistent with GALL Report(See SER Section 3.3.2.2.10.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	Compressed Air Monitoring Program (B2.1.10)	Consistent with GALL Report See SER Section 3.3.2.2.10.6
Stainless steel piping, piping components, and piping elements exposed to soil (3.3.1-29)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to PINGP (See SER Section 3.3.2.2.10.7)
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution (3.3.1-30)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.10.8)
Copper alloy piping, piping components, and piping elements exposed to treated water (3.3.1-31)	Loss of material due to pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.11)
Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil (3.3.1-32)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Yes	Fire Protection Program (B2.1.15), Fuel Oil Chemistry Program (B2.1.19) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.3.2.2.12.1)
Stainless steel piping, piping components, and piping elements exposed to lubricating oil (3.3.1-33)	Loss of material due to pitting, crevice, and micro biologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24), One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.3.2.2.12.2)

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
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	External Surfaces Monitoring Program (B2.1.14)	Consistent with GALL Report (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 PINGP (See SER Section 3.3.2.2.14)
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated water (3.3.1-36)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable	Not applicable to PWRs
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-37)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	BWR Reactor Water Cleanup System	No	Not applicable	Not applicable to PWRs
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-38)	Cracking due to stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel BWR spent fuel storage racks exposed to treated water > 60°C (> 140°F) (3.3.1-39)	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable	Not applicable to PWRs

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 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	Addressed in item 3.3.1-58 (See SER Section 3.3.2.1.1)
High-strength steel closure bolting exposed to air with steam or water leakage (3.3.1-41)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable	Not applicable to PINGP (See SER Section 3.3.2.1.1)
Steel closure bolting exposed to air with steam or water leakage (3.3.1-42)	Loss of material due to general corrosion	Bolting Integrity	No	Not Used by PINGP.	Addressed in item 3.3.1-43 (See SER Section 3.3.2.1.1)
Steel bolting and closure bolting exposed to air - indoor uncontrolled (external) or air - outdoor (external) (3.3.1-43)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Bolting Integrity Program (B2.1.6)	Consistent with GALL Report
Steel compressed air system closure bolting exposed to condensation (3.3.1-44)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Not Used by PINGP.	Addressed in item 3.3.1-43 (See SER Section 3.3.2.1.1)
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-45)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B2.1.6)	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 stress corrosion cracking	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-47)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-48)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water (3.3.1-49)	Loss of material due to microbiologically influenced corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to PWRs
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.3.1-50)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.3.1-51)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report (See SER Section 3.3.2.1.8)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.3.1-52)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
Steel compressed air system piping, piping components, and piping elements exposed to internal condensation (3.3.1-53)	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22) and Compressed Air Monitoring Program (B2.1.10)	Consistent with GALL Report (See SER Section 3.3.2.1.2)
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	Compressed Air Monitoring Program (B2.1.10)	Consistent with GALL Report
Steel ducting closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-55)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring Program (B2.1.14)	Consistent with GALL Report
Steel HVAC ducting and components external surfaces exposed to air - indoor uncontrolled (external) (3.3.1-56)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring Program (B2.1.14)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping and components external surfaces exposed to air - indoor uncontrolled (External) (3.3.1-57)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring Program (B2.1.14)	Consistent with GALL Report
Steel external surfaces exposed to air - indoor uncontrolled (external), air - outdoor (external), and condensation (external) (3.3.1-58)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring Program (B2.1.14)	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	Not applicable	Addressed in items 3.3.1-57 and 3.3.1-58 (See SER Section 3.3.2.1.1)
Steel piping, piping components, and piping elements exposed to air - outdoor (external) (3.3.1-60)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring Program (B2.1.14)	Consistent with GALL Report
Elastomer fire barrier penetration seals exposed to air – outdoor or air – indoor uncontrolled (3.3.1-61)	Increase hardness, shrinkage and loss of strength due to weathering	Fire Protection	No	External Surfaces Monitoring Program (B2.1.14) Fire Protection Program (B2.1.15)	Consistent with GALL Report (See SER Section 3.3.2.1.3)
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 (See SER Section 3.3.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel fire rated doors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-63)	Loss of material due to wear	Fire Protection	No	Fire Protection Program (B2.1.15)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to fuel oil (3.3.1-64)	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	No	Fire Protection Program (B2.1.15) Fuel Oil Chemistry (B2.1.19)	Consistent with GALL Report
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - indoor uncontrolled (3.3.1-65)	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Fire Protection Program (B2.1.15) Structures Monitoring Program (B2.1.38)	Consistent with GALL Report
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - outdoor (3.3.1-66)	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Fire Protection Program (B2.1.15) Structures Monitoring Program (B2.1.38)	Consistent with GALL Report
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-67)	Loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring Program	No	Fire Protection Program (B2.1.15) Structures Monitoring Program (B2.1.38)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to raw water (3.3.1-68)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Fire Water System Program (B2.1.16)	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
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 (B2.1.16)	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 microbiologically influenced corrosion, and fouling	Fire Water System	No	Fire Water System Program (B2.1.16)	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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with GALL Report
Steel HVAC ducting and components internal surfaces exposed to condensation (internal) (3.3.1-72)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with GALL Report
Steel crane structural girders in load handling system exposed to air - indoor uncontrolled (external) (3.3.1-73)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program (B2.1.23)	Consistent with GALL Report
Steel cranes - rails exposed to air - indoor uncontrolled (external) (3.3.1-74)	Loss of material due to Wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program (B2.1.23)	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
Elastomer seals and components exposed to raw water (3.3.1-75)	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to PINGP (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 microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System Program (B2.1.31)	Consistent with GALL Report (See SER Section 3.3.2.1.9)
Steel heat exchanger components exposed to raw water (3.3.1-77)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System Program (B2.1.31) or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22) or Fire Water Systems Program (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.1.10)
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	Not applicable	Addressed in item 3.3.1-79 (See SER Section 3.3.2.1.11)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-79)	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System Program (B2.1.31)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-80)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System Program (B2.1.31) or alternatively, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with GALL (See SER Section 3.3.2.1.4)
Copper alloy piping, piping components, and piping elements, exposed to raw water (3.3.1-81)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System Program (B2.1.31), or alternatively, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	See SER Section 3.3.2.1.5
Copper heat exchanger components exposed to raw water (3.3.1-82)	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System Program (B2.1.31) or alternatively, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22) or Fire Water Systems Program (B2.1.16)	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
Stainless steel and copper alloy heat exchanger tubes exposed to raw water (3.3.1-83)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System Program (B2.1.31) or alternatively, Fire Water Systems Program (B2.1.16) for heat exchanger components in the Fire Protection System	Consistent with GALL Report (See SER Section 3.3.2.1.7)
Copper alloy > 15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water, or closed cycle cooling water (3.3.1-84)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching of Materials Program (B2.1.36)	Consistent with GALL Report
Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water (3.3.1-85)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching of Materials Program (B2.1.36)	Consistent with GALL Report
Structural steel (new fuel storage rack assembly) exposed to air - indoor uncontrolled (external) (3.3.1-86)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	No	Not applicable	Not applicable to PINGP (See SER Section 3.3.2.1.1)
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water (3.3.1-87)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable	Not applicable to PINGP (See SER Section 3.3.2.2.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Aluminum and copper alloy > 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-88)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion Program (B2.1.7)	Consistent with GALL Report
Steel bolting and external surfaces exposed to air with borated water leakage (3.3.1-89)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion Program (B2.1.7)	Consistent with GALL Report
Stainless steel and steel with stainless steel cladding piping, piping components, piping elements, tanks, and fuel storage racks exposed to treated borated water > 60°C (> 140°F) (3.3.1-90)	Cracking due to stress corrosion cracking	Water Chemistry	No	Water Chemistry Program (B2.1.40)	Consistent with GALL Report
Stainless steel and steel with stainless steel cladding piping, piping components, and piping elements exposed to treated borated water (3.3.1-91)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Program (B2.1.40)	Consistent with GALL Report
Galvanized steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (3.3.1-92)	None	None	NA	None	Not applicable to PINGP (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
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	NA	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	NA	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	NA	None	Not applicable to PINGP (See SER Section 3.3.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.3.1-96)	None	None	NA	None	Not applicable to PINGP (See SER Section 3.3.2.1.1)
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.3.1-97)	None	None	NA	None	Consistent with GALL Report
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air (3.3.1-98)	None	None	NA	None	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-99)	None	None	NA	Not applicable	Exposure of stainless steel and copper alloy piping components to air is addressed in item 3.3.1-94 (See SER Section 3.3.2.1.1)

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:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- Bolting Integrity Program
- Boric Acid Corrosion Program
- Buried Piping and Tanks Inspection Program
- Closed-Cycle Cooling Water System Program
- Compressed Air Monitoring Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Fire Water System Program
- Flow-Accelerated Corrosion Program
- Fuel Oil Chemistry Program
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Lubricating Oil Analysis Program
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program
- One-Time Inspection Program
- Open-Cycle Cooling Water System Program
- Selective Leaching of Materials Program
- Water Chemistry Program

In LRA Tables 3.3.2-1 through 3.3.2-21, the applicant summarizes AMRs for the auxiliary system components and indicates AMRs that it claims 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 it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with Notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff 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 auxiliary system components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.3.1, 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 determined were in need of additional clarification and assessment. The staff's evaluations of these AMRs are provided in the subsections that follows.

3.3.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.3.1, item 36, 37, 38, 39 and 49, the applicant states that the corresponding AMR items in GALL Report are not applicable to PINPG because the AMR items in the GALL Report are only applicable to particular components in BWR reactor designs and because PINGP is a Westinghouse-designed PWR facility. The staff verified that the stated AMR items in the GALL Report are only applicable to BWR designed facilities and are not applicable to the PINGP LRA.

In LRA Table 3.3.1, items 41, 62, 75, 86, 92, and 95, the applicant states that the corresponding AMR result lines in the GALL Report are not applicable because PINGP does not have the component, material, and environment combination in the Auxiliary Systems. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP does not have the component, material, and environment combination in the Auxiliary Systems. Therefore, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to PINGP.

In LRA Table 3.3.1, item 96, the applicant states that further evaluation in LRA Section 3.5.2.2.1.4 concluded that steel components in concrete are not susceptible to aging and do not require aging management. The staff noted this item applies to GALL line items IV.J-21 and VII.J-17, which indicates that there is no aging effect for this component type and environment, and therefore the component do not require an AMP. The staff agrees with the applicant in that this line item does not require aging management.

In LRA Table 3.3.1, items 40, 42, 44, 59, 78, and 99, the applicant states that the corresponding AMR result lines are not used by PINGP, and points to other items in LRA Table 3.3.1 for further information. The staff noted that these other items are comprised of the same components types and managed by the same AMPs as recommended by GALL. On the basis that the applicant manage the components under items 40, 42, 44, 59, 78, and 99 through the use other different line items, the staff agrees with the applicant's treatment of these line items.

3.3.2.1.2 Loss of Material due to Pitting and Crevice Corrosion

LRA Table 3.3.1, item 3.3.1-53, addresses loss of material due to general and pitting corrosion for carbon steel components with its internal surfaces exposed to wetted air/gas in the Waste Disposal System.

The LRA credits the PINGP AMP B2.1.22 “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components” to manage this aging effect for the internal surfaces of carbon steel valve bodies in wetted air/gas environment only. The GALL Report recommends for item 3.3.1-53 that GALL AMP XI.M24, "Compressed Air Monitoring" to manage this aging effect. These AMR line items cite Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff noted that the component types in LRA AMR item 3.3.1-53 correspond to recommended AMRs in AMR item 53 in the GALL Report, Volume 1, and in AMR item VII.D-2 of the GALL Report, Volume 2 , which pertain to piping, piping components and piping elements in a compressed air system. The staff verified that the only PINGP components that the applicant had referenced to GALL AMR item VII.D-2 using a different program from the AMP recommended in these GALL AMR items are specific valve bodies in the Waste Disposal System that are fabricated from carbon steel materials. For the remaining auxiliary components that the applicant had referenced to AMR item 53 in the GALL Report, Volume 1, and in AMR item VII.D-2 of the GALL Report, Volume 2, the applicant credited the Compressed Air Monitoring Program to manage loss of material in the internal surfaces exposed to the wetted air/gas environment, which is consistent with the GALL Report recommendations and is acceptable. The staff’s evaluation of these AMR items is given in SER Section 3.3.2.1.

The staff noted that for the stated valves in the Waste Disposal System, the applicant credited its Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material in the internal surfaces that are exposed to a wetted air/gas environment. The staff noted that the wetted air/gas environment is not the same as a compressed air environment for which GALL AMP XI.M24 is intended to manage, and thus cannot be used for aging management. The staff further noted that the applicant has credited this program for aging management of loss of material due to crevice corrosion. The applicant indicates in a plant-specific note that this aging mechanism is not addressed in the GALL Report for this material, component and environment combination. The staff noted that loss of material will show evidence of material wastage on the surface regardless if the aging mechanism is general, pitting or crevice corrosion.

The staff reviewed the applicant’s Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation is documented in SER Sections 3.0.3.1.13. The staff determined that this program credits visual inspections that will be implemented during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections. The staff finds that the applicant has provided an acceptable basis for crediting the visual examinations of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material in the internal surfaces of these carbon steel valve bodies because they are equivalent to the visual examination criteria that are established in the "detection of aging effects” program element of GALL AMP XI.M24, “Compressed Air Monitoring,” for components exposed to a wetted air/gas environment and because these periodic visual inspections will be capable of detecting deterioration or degradation on the material surface that would be an indication of loss of material due to general, pitting and crevice corrosion.

On the basis of periodic visual inspections, the staff finds the applicant’s use of this program acceptable. 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).

3.3.2.1.3 Increased Hardness, Shrinkage and Loss of Strength due to Weathering

In LRA Table 3.3.1, item 3.3.1-61, addresses increased hardness, shrinkage and loss of strength due to weathering for elastomer fire barrier penetration seals exposed to outdoor air or uncontrolled indoor air in the Fire Protection System.

The LRA credits the PINGP AMP B2.1.14 “External Surfaces Monitoring Program,” to manage change in material properties due to ozone and thermal exposure and cracking due to ozone and thermal exposure for neoprene in the RCP oil collection components in a primary containment air (internal and external) environment only. The GALL Report recommends for item 3.3.1-61 that GALL AMP XI.M26, "Fire Protection," to manage this aging effect. These AMR line items cite Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff notes that the component type recommended by GALL item VII.G-1 is fire barrier penetration seals. However, the applicant referenced the RCP oil collection components when referencing item 3.3.1-61. The staff further notes that the applicant referenced item 3.3.1-61 of LRA Table 3.3.1 because there was not another applicable line item in LRA Table 3.3.1, for the Auxiliary Systems, which corresponded to the same combination of component type, material, environment, and specifically to the aging effect. The staff verified that the neoprene RCP oil collection components are within the Fire Protection System but are not fire barrier penetration seals, so the specific requirements for the inspection of fire barrier penetration seals as recommended by the GALL AMP XI.M26 “Fire Protection Program” are not applicable.

The applicant credits PINGP AMP B2.1.14 “External Surfaces Monitoring Program,” for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, “External Surfaces Monitoring,” to include non-metallic components, including PVC and fiberglass, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant’s proposed augmentation of its program. Therefore by letter dated November 5, 2008 the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including fiberglass and PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008 and the staff finds the applicant’s response acceptable as documented in the staff’s evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff’s review of the applicant’s External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff noted that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 that the applicant will perform periodic visual inspections of the elastomeric components, as supplemented by a physical manipulation, and that the inspections and physical tests will be performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable. The staff concludes that the applicant has demonstrated that he 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).

3.3.2.1.4 Loss of Material due To Pitting, Crevice, and Microbiologically Influenced Corrosion

In LRA Table 3.3.1, item 3.3.1-80, addresses loss of material due to pitting, crevice, and microbiologically influenced corrosion for stainless steel components with its internal surfaces exposed to raw water in the Cooling Water System, Radiation Monitoring System, and Diesel Generators and Support System, Waste Disposal System and Water Treatment System.

The staff noted that the applicant also referenced this item in LRA Section 3.4 for the Circulating Water, LRA Table 3.4.2-3. The staff noted that the applicant referenced item 3.3.1-80 in LRA Table 3.4.2-3 because there was not another applicable line item in LRA Table 3.4.1, for the Steam and Power Conversion Systems, which corresponded to the same component, material, environment and aging effect combination.

The staff noted that the component types in LRA AMR item 3.3.1-80 correspond to recommended AMRs in AMR item 80 in the GALL Report, Volume 1, and in AMR items VII.H2-11 and VII.H2-18 of the GALL Report, Volume 2, which pertain to copper alloy and stainless steel auxiliary system piping, piping components and piping elements in the emergency diesel generator system under internal exposure to raw water. The staff verified that the only PINGP components that the applicant had referenced to GALL AMR items using a different program from the AMP recommended in the GALL AMR items are stainless steel piping, piping components, and piping elements (including demineralizers, filter/strainer housings, flex connections, heaters, manifolds, piping/fittings, pump casings, restricting orifices and rupture discs, thermowells and valve bodies, etc.) in the Waste Disposal System, the Water Treatment System and the Circulating Water System (which is a steam and power conversion system) under exposure to an internal raw water environment.

The staff noted that for the stainless steel piping, piping components, and piping elements in the Cooling Water System, the Radiation Monitoring System, and the Diesel Generators and Support System that the applicant had referenced to GALL AMR VII.H2-18, the applicant credited the Open-Cycle Cooling Water System Program to manage loss of material in the internal surfaces exposed to the wetted air/gas environment, which is consistent with the GALL Report recommendations and is acceptable. The staff's evaluation of these AMR items is given in SER Section 3.3.2.1.

For those stainless steel components in the Waste Disposal System, Water Treatment System, and Circulating Water System whose AMR items had been referenced to GALL AMR item VII.H2-18, the staff determined the applicant's crediting of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program credits periodic visual inspections and volumetric testing that will be performed during periodic system and component surveillance activities or during maintenance activities when the internal surfaces are made accessible for visual inspections. The staff confirmed that the program description in GALL AMP XI.M38, "Internal Surfaces in Miscellaneous Piping and Ducting Components," indicates that the visual examinations of the program are valid for the detection of loss of material that may occur in the internal surfaces as a result of corrosion. The staff also noted that these visual examination activities are consistent with those visual examination activities that recommended by GALL AMP XI.M20, "Open-Cycle Cooling Water Systems."

Based on this review, the staff finds that the periodic visual inspections credited under the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program are acceptable to manage loss of material in the internal component surfaces because the visual examination basis credited under this AMP is consistent with the visual examination criteria that would be recommended under GALL AMP XI.M20, "Open-Cycle Cooling Water Systems," and because the GALL recommendation in GALL AMP XI.M38, "Internal Surfaces in Miscellaneous Piping and Ducting Components," indicates that this type of program may be used to manage loss of material by corrosion in internal piping surfaces. The staff reviewed the ability of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material due to corrosion in internal piping and ducting surfaces and the staff's evaluation of this AMP is given in SER Section 3.0.3.1.13

The staff also verified that the PINGP design does include any copper alloy components, but verified that the applicant had aligned its AMR items for these component to AMR item 81 in Table 3 of the GALL Report, and to AMR item VII.C1-9, which is a copper alloy AMR item in the GALL report for copper alloy service water piping components that is analogous and has identical aging management recommendations to those in GALL AMR item VII.H2-11 for copper diesel generator piping components. The staff's evaluation of the AMRs for these copper alloy components is given in SER Section 3.3.2.1.5.

On the basis that the applicant will perform periodic visual inspections and volumetric testing during periodic system and component surveillance activities or during maintenance activities, 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).

3.3.2.1.5 Loss Of Material Due To Pitting, Crevice, And Microbiologically Influenced Corrosion And Fouling

In LRA Table 3.3.1, item 3.3.1-81, addresses loss of material due to pitting, crevice, and MIC and fouling for copper alloy components with its internal surfaces exposed to raw water in the Cooling Water System, Station and Instrument Air System, and Diesel Generators and Support System, Waste Disposal System and Water Treatment System.

The staff noted that the component types in LRA AMR item 3.3.1-81 correspond to recommended AMRs in AMR item 81 in the GALL Report, Volume 1, and in AMR item VII.C1-9 of the GALL Report, Volume 2, which pertains to copper alloy piping, piping components and piping elements in the service water system under internal exposure to raw water. The staff verified that the only PINGP components that the applicant had referenced to referenced GALL AMR items using a different program from the AMP recommended in the GALL AMR items are copper valve bodies in the Waste Disposal System and Water Treatment System that are exposed to an internal raw water environment. The staff noted that for these copper alloy components, the applicant credited its Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material in the internal surfaces that are exposed to a raw water environment.

The staff noted that for the copper alloy piping, piping components, and piping elements in the Cooling Water System, the Station and Instrument Air System, and the Diesel Generators and Support System that the applicant had referenced to GALL AMR VII.C1-9, the applicant credited the Open-Cycle Cooling Water System Program to manage loss of material in the internal surfaces exposed to the wetted air/gas environment, which is consistent with the GALL Report recommendations and is acceptable. The staff's evaluation of these AMR items is given in SER Section 3.3.2.1.

For those copper alloy components in the Waste Disposal System and Water Treatment System whose AMR items had been referenced to GALL AMR item VII.C1-9, the staff determined the applicant's crediting of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program credits periodic visual inspections and volumetric testing that will be performed during periodic system and component surveillance activities or during maintenance activities when the internal surfaces are made accessible for visual inspections. The staff confirmed that the program description in GALL AMP XI.M38, "Internal Surfaces in Miscellaneous Piping and Ducting Components," indicates that the visual examinations of the program are valid for the detection of loss of material that may occur in the internal surfaces as a result of corrosion. The staff also noted that these visual examination activities are consistent with those visual examination activities that recommended by GALL AMP XI.M20, "Open-Cycle Cooling Water Systems."

Based on this review, the staff finds that the periodic visual inspections credited under the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program are acceptable to manage loss of material in the internal component surfaces because the visual examination basis credited under this AMP is consistent with the visual examination criteria that would be recommended under GALL AMP XI.M20, "Open-Cycle Cooling Water Systems," and because the GALL recommendation in GALL AMP XI.M38, "Internal Surfaces in Miscellaneous Piping and Ducting Components," indicates that this type of program may be used to manage loss of material by corrosion in internal piping surfaces. The staff reviewed the ability of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material due to corrosion in internal piping and ducting surfaces and the staff's evaluation of this AMP is given in SER Section 3.0.3.1.13

On the basis that the applicant will perform periodic visual inspections and volumetric testing during periodic system and component surveillance activities or during maintenance activities, the staff concludes that the applicant has demonstrated that he 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).

3.3.2.1.6 Loss Of Material due to Pitting, Crevice, Galvanic, and Microbiologically Influenced Corrosion and Fouling

In LRA Table 3.3.1, item 3.3.1-82, addresses loss of material due to pitting, crevice, galvanic, and MIC corrosion and fouling for copper heat exchanger components (i.e., heat exchanger tubes and other components) in the Control Room and Miscellaneous Area Ventilation System, Cooling Water System, Diesel Generators and Support System, Primary Containment Ventilation System, Station and Instrument Air System, Waste Disposal System, and Fire Protection System whose surfaces are exposed either internally or externally to a raw water environment.

The staff noted that the component types in LRA AMR item 3.3.1-82 correspond to recommended AMRs in AMR item 82 in the GALL Report, Volume 1, and in AMR item VII.C1-3 of the GALL Report, Volume 2, which pertains to copper alloy heat exchanger components in the service water system under internal exposure to raw water. The staff verified that the only PINGP components that the applicant had referenced to GALL AMR items using a different program from the AMP recommended in the GALL AMR items are copper alloy heat exchanger components in the Waste Disposal System and Fire Protection System that are exposed to an internal raw water environment. The staff noted that for these copper alloy heat exchanger components in the Waste Disposal System, the applicant credited its Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material in the internal surfaces that are exposed to an external raw water environment. The staff noted that for the copper alloy heat exchanger components in the Fire Protection Program, the applicant credited its Fire Water Systems Program to manage loss of material in the internal surfaces that are exposed to an external raw water environment.

The staff noted that for the copper alloy piping, piping components, and piping elements in the Cooling Water System, the Station and Instrument Air System, and the Diesel Generators and Support System that the applicant had referenced to GALL AMR VII.C1-9, the applicant credited the Open-Cycle Cooling Water System Program to manage loss of material in the internal surfaces exposed to the wetted air/gas environment, which is consistent with the GALL Report recommendations and is acceptable. The staff's evaluation of these AMR items is given in SER Section 3.3.2.1.

The staff noted that for the copper alloy heat exchanger components in the Control Room and Miscellaneous Area Ventilation System, Cooling Water System, Diesel Generators and Support System, Primary Containment Ventilation System, Station and Instrument Air System, that the applicant had referenced to GALL AMR VII.C1-3, the applicant credited the Open-Cycle Cooling Water System Program to manage loss of material in the internal surfaces exposed to the wetted air/gas environment, which is consistent with the GALL Report recommendations and is acceptable. The staff's evaluation of these AMR items is given in SER Section 3.3.2.1.

For those copper alloy heat exchanger components in the Waste Disposal System whose AMR items had been referenced to GALL AMR item VII.C1-3, the staff determined the applicant's crediting of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program credits periodic visual inspections and volumetric testing that will be performed during periodic system and component surveillance activities or during maintenance activities when the internal surfaces are made accessible for visual inspections. The staff confirmed that the program description in GALL AMP XI.M38, "Internal Surfaces in Miscellaneous Piping and Ducting Components," indicates that the visual examinations of the program are valid for the detection of loss of material that may occur in the internal surfaces as a result of corrosion. The staff also noted that these visual examination activities are consistent with those visual examination activities that recommended by GALL AMP XI.M20, "Open-Cycle Cooling Water Systems."

The staff noted that the referenced AMR items for the copper alloy heat exchanger components in the Waste Disposal System are not in the scope of an open-cycle cooling water system that is tied to the ultimate heat-sink, as described in GL 89-13, and, thus, are not within the scope of GALL AMP XI.M20, "Open-cycle Cooling Water System." During its review, the staff also noted that, in the stated AMR items for the copper alloy heat exchanger components in the Waste Disposal System, the applicant indicated that the Internal Surfaces in Miscellaneous Piping and Ducting Components is used to manage the external surfaces of the components that are exposed to the raw water environment. However, the staff noted that, for these components, the applicant credited a program that will implement visual inspections of internal component surfaces. Therefore, by letter dated December 18, 2008 the staff issued RAI 3.3.2-20-01 to the applicant and requested that the applicant clarify why a program crediting visual inspections of internal component surfaces had been credited for aging management of component surfaces that are exposed to an external raw water environment.

By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-20-01. In this response, the applicant stated these components that credit this program in a raw water environment are heat exchanger tubes and tubesheets. The applicant further stated that the internal and external environments are assigned based on the side of the heat exchanger tubes and tubesheets that is exposed to the environment. However, the applicant clarified that these components (tubes and tubesheets) are located internally to the heat exchanger shells and that is why this program is credited for aging management. The staff verified that the applicant used an equivalent aging management basis to evaluate the components whose internal and external heat exchanger surfaces were exposed to a raw water environment because the surfaces are exposed to identical material and environmental conditions. On the basis of its review, the staff finds that the applicant has provided an acceptable basis for crediting the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material in the external surfaces of the copper alloy heat exchanger tube and tubesheets in the Waste Disposal System raw water because: (1) the copper alloy material-raw water environmental combination for these externals surfaces is the same as those referenced in GALL AMR VII.C1-3 for internal surfaces, (2) these surfaces are really located internal to the shells of these heat exchangers, (3) the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program implements visual examinations of internal metallic piping and ducting surfaces to monitor for loss of material that may occur as a result of corrosion-based aging mechanism and (4) thus use of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a valid program to credit for managing of loss of material due to corrosion in the copper alloy heat exchanger tubes and tubesheets of the Waste Disposal System that are exposed to raw water. The staff's reviewed the ability of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage loss of material in the internals surfaces of metallic components and its evaluation is documented in SER Section 3.0.3.1.13.

For those copper alloy heat exchanger components in the Firs Protection System whose AMR items had been referenced to GALL AMR item VII.C1-3, the staff determined the applicant's crediting of the Fire Water Systems Program will credit (upon its enhancement, as indicated in the LRA B2.1.16) periodic visual examination and volumetric testing of the fire protection system components. The staff confirmed that the program description in GALL AMP XI.M27, "Fire Water System," indicates that the volumetric examinations of the program are valid for the detection of loss of material that may occur in the internal surfaces as a result of corrosion. The staff also noted that these volumetric examination activities are more stringent than the visual examination activities recommended by GALL AMP XI.M20, "Open-Cycle Cooling Water Systems." Based on this assessment, the staff finds that it is acceptable to credit the inspections of the Fire Water System Program in lieu of those that would be implemented if the Open-Cycle Cooling Water Program were used for aging management because the program will implement at least the visual examination examinations that would be recommended for implementation under GALL AMP XI.M20, "Open-Cycle Cooling Water," and potential volumetric examinations of the Fire Protection Heat Exchanger Components if they are accessible for ultrasonic testing (a volumetric examination technique) transducers.

The staff also noted that the GALL AMP XI.M20, "Open-Cycle Cooling Water," if it were used for these Fire Protection System heat exchanger components, would recommend that a chemical treatment be implemented as part of the preventive actions and a test program be implemented to verify heat transfer capabilities. The staff issued RAI 3.3.2.9-2 by letter dated February 20, 2009, and asked the applicant to confirm whether or not the Fire Water System Program includes any chemical treatment and heat transfer testing activities, and if not, justify why these activities are not credited for aging management.

In its letter dated February 26, 2009, in response to RAI 3.3.2.9-2, the applicant stated the following:

> "The Fire Water System Program is used in lieu of the Open-Cycle Cooling Water System Program to manage aging of Fire Protection (FP) System components that are exposed to a raw water environment other than open-cycle

cooling water. For LRA Table 3.3.2-9, Auxiliary Systems - Fire Protection System – Summary of Aging Management Evaluation, on Pages 3.3-198, 199 and 200, for copper alloy heat exchanger components and heat exchanger tubes in an internal environment of raw water, the components are exposed to untreated Mississippi River (ultimate heat sink) water. Although the Mississippi River (ultimate heat sink) is the source for both the Cooling Water (CL) System and the FP System, these FP System components are supplied by the Fire Water sub-system which is not managed by the Open-Cycle Cooling Water System Program. Therefore, PINGP has appropriately credited the Fire Water System Program.

In addition, the affected components, 121 Motor Driven Fire Pump Enclosure Cooler and the 122 Diesel Driven Fire Pump Heat Exchanger, are not safety related components and are not within the scope of NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment." Preventive actions associated with the PINGP Fire Water System Program include periodic flushing, performance testing, and inspections. Heat transfer degradation of the 121 Motor Driven Fire Pump Enclosure Cooler is managed by periodic inservice flushing during the 121 Motor Driven Fire Pump Performance Test. Heat transfer degradation of the 122 Diesel Driven Fire Pump Heat Exchanger is managed by periodically monitoring and recording the engine operating temperature during the 122 Diesel Driven Fire Pump Performance Test."

The staff reviewed the applicant response and finds the response acceptable because: (1) the copper alloy heat exchanger components are supplied by the fire water sub-system which is not managed by the Open-Cycle Cooling Water System Program; (2) the motor driven fire pump enclosure cooler and diesel driven fire pump heat exchangers are nonsafety-related and are not included in the scope of GL 89-13; and (3) the Fire Water System Program includes preventive actions such as periodic flushing, which would remove and clean any fouling, and periodic performance testing and inspection, which will monitor the performance of the heat exchangers and visually inspect for loss of material. Based on this review, the staff finds that the Fire Water System Program will adequately manage the aging effect of loss of material due to pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling of copper alloy heat exchanger components and heat exchanger tubes in an internal environment of raw water through the period of extended operation because the program credits appropriate periodic performance testing and condition monitoring activities to monitor for loss of material in the heat exchanger components as a result of the corrosion-based mechanisms mentioned in this sentence, and well as periodic flushes of the system, which should mitigate loss of material from occurring in the components.

Based on the programs identified, and response to staff's RAI, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.1.7 Reduction of Heat Transfer due to Fouling

In LRA Table 3.3.2-9, page 3.3.1-199, Fire Protection System, for copper alloy heat exchanger tubes exposed to raw water in an internal environment of raw water, PINGP has credited the Fire Water System Program to manage the aging effects of reduction of heat transfer.

The staff noted that the applicant applied Note E to this item. The applicant referenced LRA Table 3.3-1, item 3.3.1-83 and 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," the applicant proposed using the Fire Water System Program.

The staff noted that the GALL AMP recommends chemical treatment as part of the preventive actions and a test program to verify heat transfer capabilities. The staff issued RAI 3.3.2.9-2 by letter dated February 20, 2009, requesting the applicant to confirm that the Fire Water System Program includes chemical treatment and heat transfer testing capabilities, and if not, to justify how the Fire Water System Program manages the aging effect of reduction of heat transfer.

In its letter dated February 26, 2009, in response to RAI 3.3.2.9-2, the applicant stated the following:

> The Fire Water System Program is used in lieu of the Open-Cycle Cooling Water System Program to manage aging of Fire Protection (FP) System components that are exposed to a raw water environment other than open-cycle cooling water. For LRA Table 3.3.2-9, Auxiliary Systems - Fire Protection System – Summary of Aging Management Evaluation, on Pages 3.3-198, 199 and 200, for copper alloy heat exchanger components and heat exchanger tubes in an internal environment of raw water, the components are exposed to untreated Mississippi River (ultimate heat sink) water. Although the Mississippi River (ultimate heat sink) is the source for both the Cooling Water (CL) System and the FP System, these FP System components are supplied by the Fire Water sub-system which is not managed by the Open-Cycle Cooling Water System Program. Therefore, PINGP has appropriately credited the Fire Water System Program.
>
> In addition, the affected components, 121 Motor Driven Fire Pump Enclosure Cooler and the 122 Diesel Driven Fire Pump Heat Exchanger, are not safety related components and are not within the scope of NRC Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment." Preventive actions associated with the PINGP Fire Water System Program include periodic flushing, performance testing, and inspections. Heat transfer degradation of the 121 Motor Driven Fire Pump Enclosure Cooler is managed by periodic in-service flushing during the 121 Motor Driven Fire Pump Performance Test. Heat transfer degradation of the 122 Diesel Driven Fire Pump Heat Exchanger is managed by periodically monitoring and recording the engine operating temperature during the 122 Diesel Driven Fire Pump Performance Test.

The staff reviewed the applicant response and finds the response acceptable because (1) the copper alloy heat exchanger components are supplied by the fire water sub-system which is not managed by the Open-Cycle Cooling Water System Program; (2) the motor driven fire pump enclosure cooler and diesel driven fire pump heat exchangers are nonsafety-related and are not included in the scope of GL 89-13; and (3) the Fire Water System Program includes preventive actions such as periodic flushing, which would remove and clean any fouling, and periodic performance testing and inspection, which the applicant will monitor the performance of the heat exchangers and visually inspect for fouling. Based on this review, the staff finds that the Fire Water System Program will adequately manage the aging effect of reduction of heat transfer due to fouling of copper alloy heat exchanger components and heat exchanger tubes in an internal environment of raw water through the period of extended operation.

Based on the programs identified and the response to staff's RAI, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.1.8 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

LRA Table 3.3.1, AMR item 3.3.1-51, addresses loss of material due to pitting, crevice, and galvanic corrosion, for copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water in the auxiliary systems. For these components, the GALL Report recommends managing the aging effect with the Closed-Cycle Cooling Water System Program (GALL AMP XI.M21).

LRA Tables 3.3.2-3, 3.3.2.5, 3.3.2-8, 3.3.2-9, 3.3.2-11, 3.3.2-13 and 3.3.2-20 all include AMR results referring to LRA Table 3.3.1, AMR item 3.3.1-51 for heat exchanger components, heat exchanger tubes, heaters, piping/fittings, and valve bodies made of copper alloy, brass or bronze, in an environment of treated water (closed-cycle cooling water). For all of these AMR result lines, the applicant stated that the aging effects of loss of material due to pitting and crevice corrosion will be managed by the Closed-Cycle Cooling Water System Program.

The staff noted that the component, material, environment, aging effect, and AMP for these components are consistent with the recommendation in the GALL Report, Volume 1, Table 3, AMR item 51 and with GALL items VII.C2-4, VII.E1-2, VII.F1-8, VII.F1-15, and VII.H2-8. The staff noted that the applicant listed the aging effect/mechanisms as loss of material due to pitting and crevice corrosion; however, the staff also noted that the applicant did not list loss of material due to galvanic corrosion as an applicable aging effect/mechanism for these components.

In a letter dated December 18, 2008, the staff issued RAI 3.3.1-51-01 asking the applicant why loss of material due to galvanic corrosion had not been listed as an applicable aging effect/ mechanism for these components.

The applicant responded to the RAI in a letter dated January 20, 2009. In the response, the applicant stated that analysis tools provided by EPRI reports, Westinghouse generic topical reports and other industry guidelines were the primary means to identify and evaluate aging effects. The applicant further stated that OE, both industry and plant-specific, was also used.

The applicant stated that copper and copper alloys are in the middle of the galvanic series and will preferentially corrode when coupled with more cathodic metals such as stainless steel; however, the rate of corrosion is expected to be low due to the small electrochemical potential difference. The applicant also stated that OE at their plant has not identified galvanic corrosion concerns with copper and copper alloys.

The staff reviewed the applicant's RAI response and noted that the response provides a reasonable technical basis, confirmed by plant-specific OE, for the applicant to expect that loss of material due to galvanic corrosion is not an expected aging effect/mechanism for copper components exposed to treated water in systems at their plant. The staff further noted that the same inspection activities that detect loss of material due to pitting and crevice corrosion will also detect loss of material due to galvanic corrosion, if it should occur. Because the applicant has a reasonable expectation that loss of material due to galvanic corrosion will not occur, and because the applicant provides inspection for loss of material due to pitting and crevice corrosion, which would also detect indications of galvanic corrosion, the staff finds that the applicant response resolves the issues raised in RAI 3.3.1-51-01.

Based on the programs identified and the applicant's response to RAI 3.3.1-51-01, the staff finds that the effects of aging for these components have been appropriately identified and 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).

3.3.2.1.9 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion, and Fouling, and Lining/Coating Degradation

LRA Table 3.3.1, AMR item 3.3.1-76, addresses loss of material due to general, pitting, crevice, and MIC, fouling, and lining/coating degradation for steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water in the auxiliary systems. For these components, the GALL Report recommends managing the aging effect with the Open-Cycle Cooling Water System program (GALL AMP XI.M20).

LRA Tables 3.3.2-5, 3.3.2-6, 3.3.2-7, 3.3.2-8, 3.3.2-20, and 3.3.2-21 all include AMR results referring to LRA Table 3.3.1, AMR item 3.3.1-76, for which the applicant proposes using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The components are 1) humidifiers in the control room and miscellaneous area ventilation system; 2) piping and fittings in the cooling water system; 3) piping and fittings in the diesel generator and screen house ventilation system; 4) tanks and valve bodies in the diesel generators and support system; 5) filter/strainer housings, manifolds, piping and fittings, pump casings, thermowells, and valve bodies in the waste disposal system; 6) and demineralizers, eductors, filter/strainer housings, heaters, manifolds, piping and fittings, pump casings, and valve bodies in the water treatment system. For these AMR results, the material is carbon steel, cast iron or galvanized steel, the environment is raw water and aging effect is loss of material due to general, pitting, crevice, galvanic corrosion, or MIC. The AMR results refer to GALL item VII.C1-19. GALL item VII.C1-19 has the same material, environment, and aging effect combination, but recommends aging management using the Open-Cycle Cooling Water System Program. For these AMR results, the applicant cited generic Note E, indicating that the result is consistent with the GALL Report for material, environment, and aging effect, but a different AMP is credited. The staff noted that the applicant has conservatively included the aging effect of loss of material due to galvanic corrosion when referencing AMR item 3.3.1-76; the addition of this aging effect will be discussed in the staff's evaluation below.

The staff noted that in LRA Table 3.3.1, AMR item 3.3.1-76, the discussion column states that the AMR results are consistent with the GALL Report and that the aging effect is managed by the Open-Cycle Cooling Water System Program. The staff noted that the discussion column was either incorrect or misleading because the Open-Cycle Cooling Water System Program is used to manage the aging effect for only some of the AMR result lines referring to AMR item 3.3.1-76.

In a letter dated December 18, 2008, the staff issued RAI 3.3.1-76-01 asking the applicant why the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, rather than the Open-Cycle Cooling Water System Program, is used for the components associated with these AMR items; and asking the applicant to revise the discussion in LRA Table 3.3.1, AMR item 3.3.1-76, to clarify that two different AMPs are used.

The applicant responded in a letter dated January 20, 2009. In that response the applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is used in lieu of the Open-Cycle Cooling Water System program where the components managed are not exposed to an open-cycle cooling water environment. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is credited for managing the aging effects for components exposed to waste water or potable water environments in the control room and miscellaneous area ventilation, the cooling water, the diesel generator and screen house ventilation, the diesel generator and support, the waste disposal, and the water treatment systems. The applicant also stated that in LRA Table 3.3.1, AMR item 3.3.1-76, the discussion column should include reference to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The applicant revised the discussion column entry for LRA Table 3.3.1, AMR item 3.3.1-76 to read as follows : "Consistent with NUREG-1801. This aging effect is managed with the Open-Cycle Cooling Water System Program. In some cases, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is credited in lieu of the Open-Cycle Cooling Water System Program."

The staff finds the applicant's change to Table 3.3.1, AMR item 3.3.1-76, acceptable because it resolves issues raised in RAI 3.3.1-76-01 by correcting a previous omission in the discussion column. The staff's evaluation of the applicant's basis for crediting the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program for aging management is presented in the paragraphs that follow.

The staff verified that the only piping, piping components and piping elements that the applicant aligned to GALL item VII.C1-19 are fabricated from steel materials (carbon steel, cast iron, or galvanized steel). The staff noted that those AMR line items are not in the scope of an open-cycle cooling water system as described in GL 89-13 and not associated with the ultimate heat sink, and therefore are not within the scope of GALL AMP XI.M20. The staff noted that the applicant referenced GALL item VII.C1-19 because the material, environment and AERM corresponded. For those AMR line items that are in-scope of the GL 89-13, the staff confirmed that for the same combination of component, material, environment and aging effect requiring management the applicant has credited the Open-Cycle Cooling Water System Program. The staff reviewed the Open-Cycle Cooling Water System Program and its evaluation is documented in SER Section 3.0.3.1.20.

During its review of the applicant's AMR line items the staff noted that the applicant has credited the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program with managing the aging effect of loss of material due to galvanic corrosion. The staff noted that in the GALL Report, item VII.C1-19 is not applicable for this aging mechanism. However the staff confirmed in the LRA that the applicant is managing loss of material due to general, pitting, or crevice corrosion, and MIC, fouling, and lining/coating degradation that are applicable based on the recommendations of the GALL Report item VII.C1-19. The staff noted that the applicant is conservatively managing the additional aging mechanism of galvanic corrosion. The staff finds it acceptable for the applicant to include the aging effect of loss of material due to galvanic corrosion to the scope of this GALL AMR line item because the applicant is managing all aging mechanisms recommended by the GALL Report in addition to galvanic corrosion.

The staff's review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Section 3.0.3.1.13. The staff determined that this program which includes periodic visual inspections and volumetric testing, when appropriate, during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections are adequate to manage loss of material for steel piping, piping components and piping elements exposed to raw water (internal) addressed by this AMR. The staff further noted that these activities are consistent with those recommended by GALL AMP XI.M20. The staff also determined that the periodic visual inspections will be capable of detecting deterioration or degradation on the material surface that would be an indication of loss of material.

On the basis of periodic visual inspections, the staff finds the applicant's use of this program acceptable because the visual examination credited under the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program for these components are consistent with the visual examinations that would be recommended under GALL AMP XI.M20 if the raw water source for the components was tied to the ultimate heat sink. 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).

3.3.2.1.10 Loss of Material Due to General, Pitting, Crevice, Galvanic, and Microbiologically Influenced Corrosion, and Fouling

LRA Table 3.3.1, AMR item 3.3.1-77, addresses loss of material due to general, pitting, crevice, galvanic corrosion and by MIC, and fouling for steel heat exchanger components exposed to raw water in auxiliary systems. For these components, the GALL Report recommends managing the aging effect with the Open-Cycle Cooling Water System program (GALL AMP XI.M20).

LRA Table 3.3.2-20 includes AMR results for carbon steel heat exchanger components in the waste disposal system referring to LRA Table 3.3.1, AMR item 3.3.1-77, for which the applicant proposes using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. For these AMR results, the environment is raw water, and the aging effect is loss of material due to general, pitting, crevice, or galvanic corrosion, and by MIC. The AMR results refer to GALL item VII.C1-5, which recommends aging management using the Open-Cycle Cooling Water System Program. For these AMR results, the applicant cited generic Note E, indicating that the result is consistent with the GALL Report for material, environment, and aging effect, but a different AMP is credited.

The staff noted that the discussion column in LRA Table 3.3.1, AMR item 3.3.1-77, states that the AMR results are consistent with the GALL Report and that the aging effect is managed by the Open-Cycle Cooling Water System Program. The staff also noted that the discussion further states that in some cases, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program or the Fire Water System Program is credited in lieu of the Open-Cycle Cooling Water System Program. The staff reviewed all AMR results lines referring to LRA Table 3.3.1, AMR item 3.3.1-77, but was unable to find any AMR results where the Fire Water System Program was credited.

In a letter dated December 18, 2008, the staff issued RAI 3.3.1-77-01 asking the applicant to identify the AMR results line in the LRA that refer to AMR item 3.3.1-77 and where the Fire Water System Program is credited to provide aging management. The RAI also asked the applicant to explain why the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program or the Fire Water System Program (if actually used) are credited in lieu of the Open-Cycle Cooling Water System Program for some of these AMR result lines.

The applicant responded in a letter dated January 20, 2009. In that response the applicant stated that in LRA Table 3.3.1, AMR item 3.3.1-77, reference to the Fire Water System Program for providing aging management is incorrect, and that the reference to the Fire Water System Program should be deleted. The applicant revised the discussion column entry for LRA Table 3.3.1, AMR item 3.3.1-77 to read as follows: "Consistent with NUREG-1801. This aging effect is managed with the Open-Cycle Cooling Water System Program. In some cases, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is credited in lieu of the Open-Cycle Cooling Water System Program."

The applicant also stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is used in lieu of the Open-Cycle Cooling Water System Program where the components managed are not exposed to an open-cycle cooling water environment. The applicant stated that for LRA Table 3.3.1, AMR item 3.3.1-77, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is credited for components exposed to a waste water environment in the waste disposal system.

The staff finds the applicant's change to Table 3.3.1, AMR item 3.3.1-77, acceptable because it corrects an error. The staff's evaluation of the applicant's use of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program in lieu of the Open-Cycle Cooling Water System Program is presented below.

The staff reviewed all components evaluated under AMR item 3.3.1-77 where the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Component Program is credited for aging management in lieu of the Open-Cycle Cooling Water System Program, which is the AMP recommended in the GALL Report for aging management. The staff confirmed that the only components in this category are carbon steel heat exchanger components in a raw water environment in the waste disposal system.

The staff noted that those AMR line items are not in the scope of an open-cycle cooling water system as described in GL 89-13 and not associated with the ultimate heat sink, and therefore are not with in the scope of GALL AMP XI.M20. The staff noted that the applicant referenced GALL item VII.C1-5 because the material, environment and aging effect requiring management corresponded. For those AMR line items that are in-scope of the GL 89-13, the staff confirmed that for the same combination of component, material, environment and aging effect requiring management the applicant has credited the Open-Cycle Cooling Water System Program. The staff reviewed the Open-Cycle Cooling Water System Program and its evaluation is documented in SER Section 3.0.3.1.20.

The staff noted during its review that several of the heat exchanger components are exposed to an external environment of raw water; however, the applicant credits a program that will perform visual inspections of the internal surfaces for aging management. Therefore by letter dated December 18, 2008, the staff issued RAI 3.3.2-20-01, requesting the applicant to clarify why a program that performs visual inspections of internal surfaces has been credited for aging management of component surfaces that are exposed to an external raw water environment. By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-20-01, by stating that the components that credit this program in a raw water environment are heat exchanger tubes and tubesheets. The applicant further stated that the internal and external environments are assigned based on the side of the heat exchanger tubes and tubesheets that are exposed to the raw water environment. The applicant clarified that though the external surfaces of the heat exchanger tube and tubesheets are exposed to raw water environment, these component surfaces are located internally to the heat exchanger shells. Therefore, the applicant clarified that it was appropriate to credit this program for aging management because they would have to access the internals of the heat exchangers to be able to implement the inspections of this program credited for aging management. The applicant also clarified that the internal environment for the heat exchanger tubes and tubesheets are also located internally to the heat exchanger shells but are evaluated in other AMR items of the LRA.

The staff noted the applicant’s response to RAI 3.3.2-20-01, but was of the opinion that additional information was needed to clarify exactly how the visual examination of these tubes and tubesheets would be accomplished. Therefore, in a letter dated December 18, 2008, the staff issued RAI 3.3.2-20-02. In this RAI, the staff requested that the applicant justify how a visual inspection would be capable of detecting loss of material in these components in those regions that are not directly visible or accessible (for example the bend of a heat exchanger tube). The applicant responded to RAI 3.3.2-20-02 in a letter dated January 20, 2009. In this response, the applicant stated that this program is credited for aging management of heat exchanger components that include tubes, shells, tubesheets and channelheads. The applicant further stated the activities that will be performed as part of this program to detect degradation of these carbon steel components include periodic visual inspections during surveillance and maintenance activities, when the heat exchangers are opened up for access.

The staff noted that, in its response to RAI 3.3.2-20-01, the applicant stated that it will choose the inspection locations based on conditions that are susceptible to the aging effects of concern. The staff further noted that the applicant’s inspection will monitor parameters such as rust, discoloration, scale/deposits, pitting and surface discontinuities which are indications that loss of material and degradation are occurring. Based on the applicant's response to RAI 3.3.2-20-01, the staff noted the applicant evaluated the internal and external environments of these heat exchanger tubes and components separately because these components are physically internal to the heat exchanger. The staff confirmed in LRA Table 3.3.2-20 that the applicant evaluated the external side and internal side of the heat exchanger tubes and components, separately. Furthermore, the staff noted that the applicant is crediting a visual inspection on the external side of these heat exchanger tubes and components, which will be capable of identifying indications of loss of material on all areas of the heat exchanger tubes, including the bends of the components. The staff confirmed that for the internal side of these heat exchanger tubes and components the applicant has credited the GALL recommended program for aging management. On the basis of its review, the staff finds the applicant's response to RAI 3.3.2-20-01 acceptable because (1) the visual inspections of these components are at locations that have conditions that are susceptible to the aging effect of loss of material and (2) a visual inspection of these components will be capable of identifying evidence that may be indicative of degradation and loss of material.

The staff reviewed the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Sections 3.0.3.1.13. The staff's evaluation is documented in SER Section 3.0.3.1.13. This program includes periodic visual inspections and volumetric testing, when appropriate, during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections. Therefore, the staff finds it to be adequate to manage loss of material for metallic exchanger components that are exposed to raw water (external and internal) addressed by this AMR. Thus, the staff noted that the condition monitoring activities credited under the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program are consistent with the visual examinations that are recommended in GALL AMP XI.M20, "Open-Cycle Cooling Water System," and that the periodic visual inspections will be capable of detecting deterioration or degradation on the material surface that would be an indication of loss of material.

The staff finds the applicant's use of this program acceptable because the visual examination of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program for these components are consistent with the visual examinations recommended by GALL AMP XI.M20. The staff finds this program acceptable also because it is identified by the GALL Report as an appropriate program for managing loss of material in internal metallic component surfaces. 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).

3.3.2.1.11 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.3.1, AMR item 3.3.1-78, addresses loss of material due to pitting and crevice corrosion for stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water in auxiliary systems. For these components GALL Report recommends managing the aging effect with the Open-Cycle Cooling Water System Program (GALL AMP XI.M20).

The staff noted that the discussion column in LRA Table 3.3.1, AMR item 3.3.1-78, states that the AMR evaluation line was not used and refers to line 3.3.1-79 for further discussion. The staff also noted that the discussion column for AMR item 3.3.1-79 did not include any discussion of AMR item 3.3.1-78, although the discussion column in 3.3.1-78 suggested that it would.

In a letter dated December 18, 2008, the staff issued RAI 3.3.1-78-01 asking the applicant to revise the statement in the discussion column of AMR item 3.3.1-78 or to add a discussion of AMR item 3.3.1-78 into the discussion column of AMR item 3.3.1-79.

The applicant responded in a letter dated January 20, 2009. The applicant stated that in LRA Table 3.3.1, the discussion column for LRA AMR item 3.3.1-78 is intended to provide a convenient link to clarify that the material, environment, aging effect combination in line 3.3.1-78 is applicable, but is evaluated under a different line (3.3.1-79). The applicant further stated that AMR item 3.3.1-78 is not used, but that no additional detail is needed in the line 3.3.1-79 discussion column.

The staff notes that the applicant’s response does not make the change requested in the RAI. However, the response does clarify that components that might have been evaluated under Table 3.3.1, AMR item 3.3.1-78 are included in the evaluation of Table 3.3.1, item 3.3.1-79.

The staff reviewed all components included in LRA Table 3.3.1, AMR item 3.3.1-79, and noted that the component materials are stainless steel or CASS. The staff also noted that stainless steel is one of the materials called out in LRA Table 3.3.1, AMR item 3.3.3-78. The staff noted that for both AMR item 3.3.1-78 and AMR item 3.3.1-79 the environment is raw water. The staff further noted that the aging effect/mechanisms identified for AMR item 3.3.1-78 are a subset of those identified for AMR item 3.3.1-79 because AMR item 3.3.1-79 lists fouling in addition to loss of material due to pitting and crevice corrosion, which are the only aging effect/mechanisms listed for AMR item 3.3.1-78. The staff also noted that, for both AMR items, GALL AMR items 78 and 79 in Table 3 of the GALL Report, Volume 1, both recommend that the Open-Cycle Cooling Water System Program be credited to manage loss of material in the stainless steel piping, piping component and piping element surfaces that are exposed to raw water. Because the components, material and environment at the applicant’s plant are listed in both AMR item 3.3.1-78 and in AMR item 3.3.1-79, and because the aging effects in AMR item 3.3.1-78 are also included in AMR item 3.3.1-79, and the recommended AMP is the same in both AMR result lines, the staff finds that it is acceptable for the applicant to indicate that AMR item 3.3.1-78 is not used for the PINGP LRA and that instead the applicant evaluates loss of material in these CASS components in LRA AMR item 3.3.1-79.

Because the applicant’s RAI response states that Table 3.3.1, AMR item 3.3.1-78, is not used and the discussion column is simply providing a link to Table 3.3.1, AMR item 3.3.1-79, where the same component, material environment and aging effect combinations are evaluated, the staff finds that the applicant’s response resolved all issues raised in RAI 3.3.1-78-01. The staff also finds it acceptable for the applicant to designate Table 3.3.1, AMR item 3.3.1-78, as not used because all components that might have been included in this AMR result line have been included and evaluated in Table 3.3.1, AMR item 3.3.1-79.

Based on the program identified and the applicant's response to RAI 3.3.1-78-01, the staff finds that the effects of aging for these components have been appropriately identified and will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.3.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the auxiliary system 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 4.7.4 and 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

LRA Section 3.3.2.2.2 addresses reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water in the auxiliary systems. For this component, material, environment and aging effect combination, the GALL Report recommends aging management using the Water Chemistry Program (GALL AMP XI.M2) and the One-Time

Inspection Program (GALL AMP XI.M32). In LRA Section 3.3.2.2.2 the applicant stated that the GALL Report line items referring to the SRP-LR and GALL Report, Volume 1, AMR item 3.3.1-3, are applicable to BWR systems only. In LRA Table 3.3.1, AMR item 3.3.1-3, the applicant also stated that the AMR result line is not applicable to PWRs, but is applicable to the auxiliary systems in BWRs. The applicant designated the AMR result line as not applicable because the applicant's plant is a PWR.

The staff reviewed LRA Section 3.3.2.2.2 against the criteria in SRP-LR Section 3.3.2.2.2, which states that reduction of heat transfer due to fouling may occur for stainless steel heat exchanger tubes exposed to treated water. The SRP-LR states that the existing program relies on control of water chemistry to manage reduction of heat transfer due to fouling. In addition, the GALL Report recommends that the effectiveness of the water chemistry control program should be verified to ensure that reduction of heat transfer due to fouling is not occurring.

SRP-LR Section 3.3.2.2.2, AMR item 3 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.A4-4 and VII.E3-6, are applicable for stainless steel heat exchanger tubes exposed to treated water in the BWR spent fuel pool cooling and cleanup systems and in BWR reactor water cleanup systems.

The staff noted that the AMR items in the GALL Report that refer to SRP-LR Section 3.3.2.2.2 are for heat exchanger tubes in a BWR spent fuel pool cooling system and in a reactor water cleanup system, which is a BWR system, not a PWR system. The staff also noted that the Closed-Cycle Cooling Water System Program provides management for the aging effect of reduction of heat transfer due to fouling in stainless steel heat exchangers exposed to treated water in the applicant's auxiliary systems. On the basis that the systems listed in the GALL Report are applicable only for BWRs and the applicant manages the aging effect of reduction of heat transfer due to fouling with the Closed-Cycle Cooling Water System Program for heat exchangers in the auxiliary systems, the staff finds the applicant's determination that LRA Table 3.3.1, AMR item 3.3.1-3, is not applicable to be acceptable.

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

(1) LRA Section 3.3.2.2.3.1 addresses GALL AMR items VII.E2.4-a, VII.E2.1-a, VII.E2.2-a, and VII.E2.3-a, on the management of cracking due to SCC of stainless steel and stainless clad steel heat exchanger components exposed to a treated water > 60 °C (>140 °F) environment. In this section of the LRA, the applicant states that [SRP-LR] Section 3.3.2.2.3.1 is not applicable to PINGP because this item is applicable to BWR plants only

    SRP-LR Section 3.3.2.2.3.1 states that cracking due to SCC may occur in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 60 °C (>140 °F) environment.

    The staff noted this item is not applicable to PINGP because PINGP is a PWR plant and does not have BWR Standby Liquid Control System, which contains the component type specified in LRA Section 3.3.2.2.3.1. On this basis, the staff finds that the criteria in SRP-LR 3.3.2.2.3.1 do not apply to PINGP.

(2) LRA Section 3.3.2.2.3.2 addresses cracking due to SCC for stainless steel and stainless steel clad heat exchanger components exposed to treated water >60ºC (>140ºF) in the auxiliary systems. For this component, material, environment and aging effect combination, the GALL Reports recommends that a plant-specific AMP be evaluated. In LRA Section 3.3.2.2.3.2 the applicant stated that the [SRP-LR] and the GALL Report indicate Table 3.3.1, AMR item 3.3.1-5, is applicable to both PWR and BWR nuclear power plants. However, the applicant also stated that the GALL Report, Volume 2, line items VII.E-3 and VII.3-19, which refer to this AMR result line, are applicable only for BWR systems. Similarly, in the discussion column in LRA Table 3.3.1, AMR item 3.3.1-5, the applicant stated that the line item is not applicable to PWRs, but is applicable to the auxiliary systems in BWRs. The applicant designated the AMR result line as not applicable because the applicant's plant is a PWR.

The staff reviewed LRA Section 3.3.2.3.2 against the criteria in SRP-LR Section 3.3.2.2.3.2, which states that cracking due to SCC could occur in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 60°C (>140°F).

SRP-LR Section 3.3.2.2.3.2, AMR item 5 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.E3-3 and VII.E3-19, are applicable to stainless steel and steel with stainless steel cladding heat exchanger components in BWR spent fuel cleanup and cooling systems and to stainless steel regenerative heat exchanger components in BWR reactor water cleanup systems.

The staff noted that the AMR item in the GALL Report are for components in a reactor water cleanup system, which is a BWR system. Therefore, the staff finds it acceptable that the applicant has designated AMR item 3.3.1-5 to be not applicable.

(3) LRA Section 3.3.2.2.3.3 addresses cracking due to SCC in stainless steel diesel engine exhaust piping, piping components and piping elements exposed to diesel exhaust. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage this aging effect in stainless steel internal surfaces exposed to diesel exhaust.

The staff reviewed LRA Section 3.3.2.2.3.3 against the criteria in SRP-LR Section 3.3.2.2.3.3, which states that cracking can occur in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust can occur and recommends further evaluation of a plant-specific AMP to ensure this aging effect is adequately managed.

The GALL Report, under item VII.H2-1 recommends that a plant-specific program be credited to manage loss of material due to pitting and crevice corrosion for steel piping, piping components and piping elements in the Auxiliary Systems.

The staff verified that only flex connections align to GALL AMR VII.H2-1 for the Auxiliary System – Diesel Generators and Support System that are fabricated from stainless steel materials are applicable to PINGP that credit this program.

The staff’s review of the applicant’s Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Sections 3.0.3.1.13. The applicant stated that this is a new PINGP program that will perform periodic visual inspection of the internal surfaces of components to manage loss of material due to several mechanisms.

However, the staff noted that a visual inspection alone may not be capable of identifying the aging effect of cracking due to stress corrosion cracking in components fabricated from stainless steel. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.22-1, in which it asked the applicant to identify and justify the inspection techniques that will be used by this program to manage cracking due to stress corrosion cracking or provide an appropriate program that will be capable of managing this aging effect. By letter dated December 5, 2008, the applicant responded to the RAI by stating the inspection techniques that will be utilized to detect this aging effect are either a visual inspection with a magnified resolution as described in 10 CFR 50.55a(b)(2)(xxi)(A) or an ultrasonic inspection method. The staff further notes that the inspection method described in 10 CFR 50.55a(b)(2)(xxi)(A) is an enhanced VT-1 inspection technique and that GALL AMP XI.M32 recommends the use of an enhanced VT-1 or ultrasonic inspection technique as an acceptable means to detect cracking due to stress corrosion cracking. The staff notes that the inspection techniques described by the applicant will be performed by qualified personnel in accordance with PINGP procedures and processes. The staff’s evaluation of RAI B2.1.22-1 is documented in SER Section 3.0.3.1.13.

Based on these clarifications, the staff noted that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program includes enhanced VT-1 or ultrasonic inspection of the internal surfaces of components during periodic system and component surveillance activities or during maintenance activities when the internal surface becomes accessible for inspections to detect aging effects that could result in a loss of the component's intended function The staff finds this to be an acceptable basis for managing cracking due to SCC of the components because the program includes enhanced VT-1 visual examination activities that are consistent with the recommendations in the GALL Report, and these activities will be adequate to any cracking that may occur in stainless steel diesel engine exhaust piping, piping components and piping elements as a result of SCC.

Based on the program identified, the staff concludes that the applicant’s program meets SRP-LR Section 3.3.2.2.3.3 criterion. For those line items that apply to LRA Section 3.3.2.2.3.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.4 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

The staff reviewed LRA Section 3.3.2.2.4 against the following criteria in SRP-LR Section 3.3.2.2.4:

(1) LRA Section 3.3.2.2.4.1 addresses cracking due to SCC and cyclic loading in stainless steel non-regenerative heat exchanger components exposed to treated borated water > 60ºC (>140ºF) in the auxiliary systems. The applicant stated that the aging effect will be managed by the Water Chemistry Program in combination with the One-Time Inspection Program. For applicable AMR results in LRA Table 3.3.2-2, the applicant cited generic Note E, indicating that the result is consistent with the GALL Report for material, environment and aging effect, but a different AMP is credited or that the GALL Report identifies a plant-specific AMP.

The staff reviewed LRA Section 3.3.2.2.4.1 against the criteria of SRP-LR Section 3.3.2.2.4.1, which states that cracking due to SCC and cyclic loading may occur in stainless steel PWR non-regenerative heat exchanger components exposed to treated borated water greater than 60°C (>140°F) in the chemical and volume control system. This SRP-LR section states that the existing AMP relies on monitoring and control of primary water chemistry in PWRs to manage the aging effects of cracking due to SCC. However, the SRP-LR section clarifies that control of water chemistry does not preclude cracking due to SCC and cyclic loading, and therefore recommends that the effectiveness of the water chemistry control program be verified to ensure that cracking is not occurring. The SRP-LR section identifies that GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are managed adequately, and that an acceptable verification program is to include temperature and radioactivity monitoring of the shell side water and eddy current testing of the tubes.

SRP-LR Section 3.3.2.2.4.1, AMR item 7 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.E1-9, are applicable to stainless steel non-regenerative heat exchanger components exposed to treated borated water greater than 60°C (>140°F) in the chemical and volume control system (PWR). The staff's aging management recommendations in these GALL AMR items are the same as those discussed in SRP-LR Section 3.3.2.2.4.1.

In a letter dated December 18, 2008, the staff issued RAI AMR-3.3.2.2.4.1-01 asking the applicant to provide additional details about the methodology it proposed to use for examination of the non-regenerative heat exchangers and previous OE with these components.

The applicant provided a response to RAI AMR-3.3.2.2.4.1-01 in a letter dated January 20, 2009, and further clarification of that response in a letter dated February 26, 2009. In its response and subsequent clarification, the applicant stated that the non-regenerative heat exchangers addressed by this AMR item are the letdown and the excess letdown heat exchangers in the chemical and volume control system. The applicant also included in its response discussion of the chemical and volume control system's regenerative heat exchangers which are addressed by AMR item 8 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.E1-5. The applicant stated that the Water Chemistry Program and the One-Time Inspection Program will be used to manage the aging effect of cracking due to SCC in these stainless steel components exposed to treated borated water greater than 60°C (>140°F). The applicant further stated that the One-Time Inspection Program was selected in lieu of eddy current testing of the non-regenerative heat exchanger tubes and that the One-Time Inspection Program uses enhanced visual (VT-1 or equivalent) and/or volumetric methods to detect cracking due to SCC. The applicant stated that the One-Time Inspection Program uses a representative sampling approach to verify that significant degradation is not occurring, and that the sampling is based on an assessment of material of fabrication, environment, plausible aging effects, and OE. The applicant stated that the letdown and excess letdown heat exchangers are highly contaminated components, and that one-time Inspections of similar components with the equivalent material and environment combinations provides confirmation of the effectiveness of the Water Chemistry Program without requiring unnecessarily high personnel exposure. The applicant further stated that temperature and radioactivity monitoring of these non-regenerative heat exchangers is provided by installed plant instrumentation, and that the instrumentation provides points that are monitored on the plant's process computer.

The staff noted that the applicant's proposed management for the aging effect of cracking due to SCC in the non-regenerative heat exchangers includes temperature and radioactivity monitoring as recommended in the GALL Report; however, it does not include the recommended eddy current testing of the heat exchanger tubes. The staff noted, however, that for GALL Report, Volume 1, Table 3, item 90, the AMP recommended to manage the aging effect of cracking in stainless steel piping exposed to treated borated water greater than 60°C (>140°F) is the Water Chemistry Program, alone. The staff also noted that for GALL Report, Volume 1, Table 4, AMR item 14, the AMPs recommended to manage the aging effect of cracking in stainless steel piping exposed to treated water greater than 60°C (>140°F) are the Water Chemistry Program augmented by the One-Time Inspection Program for verification of water chemistry effectiveness. In this regard, the staff noted that the One-Time Inspection Program accomplishes verification of Water Chemistry Program effectiveness by crediting volumetric or enhanced VT-1 inspection techniques to confirm that cracking has not initiated in the components or, if it has, that it is progressing very slowly . The staff finds that the applicant has provided an acceptable basis for crediting the Water Chemistry Program and the One-Time Inspection Program because it is in accordance with the recommendations in GALL Report, Volume 1, Table 4, AMR item 14 and because GALL AMP XI.M32, "One-Time Inspection," indicates that volumetric examination methods or enhanced VT-1 visual examination methods are acceptable methods for the detection of cracking.

In its supplemental response dated February 26, 2009, the applicant stated that cracking due to cyclic loading is not an applicable aging mechanism because of the design and operation of the regenerative and non-regenerative heat exchangers in the chemical and volume control system. The applicant stated that a full fatigue analysis was not required for these heat exchangers; however, the Westinghouse design specification for these components included requirements to demonstrate that the heat exchangers satisfied all conditions of ASME Code Section III, Paragraph N-415.1, "Vessels Not Requiring Analysis for Cyclic Operation," for the transient conditions specified. The applicant stated that through compliance with N-415.1 (a) through (f), which consider pressure fluctuations, thermal cycling, and mechanical loading, the allowable peak stress limit is satisfied for these heat exchangers so that an analysis for cyclic operation is not required. The applicant stated that from a design standpoint, the regenerative heat exchangers, the letdown heat exchangers and the excess letdown heat exchangers are not subject to cracking due to cyclic loading. The applicant further stated that the regenerative heat exchangers and letdown heat exchangers typically remain in service throughout the entire operating cycle and that the excess letdown heat exchanger is normally isolated during plant operation and is put into service only when the normal letdown path is not available. The applicant stated that as a result of these operating practices, the heat exchangers are not subject to repeated thermal and pressure cycling, and that, therefore, from an operational standpoint, cracking due to cyclic loading does not apply to these heat exchangers. As part of its supplemental response, the applicant revised LRA Table 3.3.1, items 3.3.1-7 and 3.3.1-8, to state that cracking due to cyclic loading is not an applicable aging effect; the applicant also revised LRA Sections 3.3.2.2.4, item 1 and item 2, in their entirety to include summary presentation of the additional information described above.

The staff noted that in the applicant's response, both a design basis and an operational basis was provided to support a conclusion that cracking due to cyclic loading is not applicable for the regenerative heat exchangers and for the letdown and the excess letdown heat exchangers exposed to treated borated water greater than 60°C (>140°F) in the chemical and volume control system. Because the applicant has provided an adequate technical basis to exclude cracking due to cyclic loading as an applicable aging mechanism for these heat exchangers, the staff finds that this aging mechanism is not applicable for the subject heat exchanges.

For reasons stated above, the staff finds the applicant's proposed aging management of cracking due to SCC to be acceptable. The staff also finds the applicant's determination that cracking due to cyclic loading is not applicable to be acceptable. On these bases, including the applicant's response and further clarification related to RAI AMR-3.3.2.2.4.1-01, the staff finds the applicant's AMR results to be acceptable.

Based on the programs identified and on the applicant's response to RAI AMR-3.3.2.2.4.1-01 in a letter dated January 20, 2009, and further clarification in a letter dated February 26, 2009, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.4 criteria. For those AMR items that apply to LRA Section 3.3.2.2.4.1, 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).

(2) LRA Section 3.3.2.2.4.2 addresses cracking due to SCC and cyclic loading in stainless steel regenerative heat exchanger components exposed to treated water >60ºC (>140ºF) in the auxiliary systems. The applicant stated that the aging effect will be managed by the Water Chemistry Program in combination with the One-Time Inspection Program.

The staff reviewed LRA Section 3.3.2.2.4.2 against the criteria of SRP-LR Section 3.3.2.2.4.2, which states that cracking due to SCC and cyclic loading may occur in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 60°C (>140°F). This SRP-LR section states that the existing

AMP relies on monitoring and control of primary water chemistry in PWRs to manage the aging effects of cracking due to SCC. However, the SRP-LR section clarifies that control of water chemistry does not preclude cracking due to SCC and cyclic loading and therefore recommends that the effectiveness of the water chemistry control program should be verified to ensure that cracking is not occurring. The SRP-LR section identifies that the GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are managed adequately.

SRP-LR Section 3.3.2.2.4.2, AMR item 8 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.E1-5, applicable to stainless steel heat exchanger components exposed to treated borated water greater than 60°C (>140°F) in the chemical and volume control system (PWR). The GALL Report credits use of the Water Chemistry Program for PWR Primary Water and recommends that the AMP be augmented by a plant-specific verification program.

The staff noted that the applicant proposes to use the One-Time Inspection Program to verify effectiveness of the Water Chemistry Program to mitigate the aging effect of cracking in both the non-regenerative heat exchangers (AMR item 3.3.1-7) and in the regenerative heat exchangers (AMR item 3.3.1-8). The staff asked the applicant to address examination of both heat exchanger types in RAI AMR-3.3.2.2.4.1-01, which is discussed in SER Section 3.3.2.2.4.1. The staff's evaluation of the applicant's response is provided in that SER section.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program, provides mitigation for cracking due to SCC in stainless steel components. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18 found that the One-Time Inspection Program is adequate to detect the presence or note the absence of cracking due to SCC for components within its scope. The staff confirmed 1) that the applicant is crediting AMPs as recommended in GALL AMR item VII.E1-5; 2) that the Water Chemistry Program implements chemistry related activities to mitigate degradation caused by cracking due to SCC, and 3) that the One-Time Inspection Program is identified in the GALL Report as an acceptable program to provide verification of the effectiveness of the Water Chemistry Program to mitigate cracking due to SCC in stainless steel components. The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.3.2.2.4.2 and in GALL AMR item VII.E1-5.

Based on the programs identified and on the applicant's response to RAI AMR-3.3.2.2.4.1-01, as evaluated in SER Section 3.3.2.2.4.1 and applied to the staff's evaluation in this SER section, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.4.2 criteria. For those AMR items that apply to LRA Section 3.3.2.2.4.2, 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) LRA Section 3.3.2.2.4.3 addresses cracking due to SCC and cyclic loading in stainless steel high pressure pump casing in PWR chemical and volume control system. The applicant stated that the aging effect will be managed by the Water Chemistry Program in combination with the One-Time Inspection Program. For the AMR result line showing the One-Time Inspection Program, the applicant cites generic Note E, indicating that the GALL Report recommends a plant-specific program be used to verify the absence of cracking due to SCC and cyclic loading.

The staff reviewed LRA Section 3.3.2.2.4.3 against the criteria of SRP-LR Section 3.3.2.2.4.3, which states that cracking due to SCC and cyclic loading may occur in stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. The SRP-LR states that the existing AMP relies on monitoring and control of 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 the water chemistry control program should be verified to ensure that cracking is not occurring. The GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are managed adequately.

SRP-LR Section 3.3.2.2.4.3, AMR item 9 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.E1-7, are applicable to stainless steel high pressure pump casings exposed to treated borated water in the chemical and volume control system (PWR). The GALL Report recommends that a plant-specific AMP be credited to manage cracking of these pump casings as a result of SCC or cyclical loading.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program provides mitigation for cracking due to SCC in stainless steel components. The staff also reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the One-Time Inspection Program is consistent with GALL AMP XI.M32, "One-Time Inspection," and that the program is adequate to detect the presence or note the absence of cracking due to SCC or cyclic loading for components within its scope. The staff noted that the GALL Report states that a one-time inspection program is an acceptable program to verify effectiveness of a mitigative AMP (e.g., the Water Chemistry Program). Thus, the staff confirmed that: (1) the applicant is crediting the Water Chemistry Program as recommended in GALL AMR item VII.E1-7; and (2) that the applicant is verifying effectiveness of the Water Chemistry by use of the One-Time Inspection Program, which the GALL Report states is an acceptable program for verification of Water Chemistry Program effectiveness. Based on this review, the staff finds the applicant's AMR results acceptable because the AMRs credited for aging management of cracking in these stainless steel pump casing are consistent with the guidance is SRP-LR Section 3.3.2.2.4.3 and with the staff's recommended AMR position established in GALL AMR item VII.E1-7.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.4 criteria. For those line items that apply to LRA Section 3.3.2.2.4.3, 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).

(4) LRA Section 3.3.2.2.4.4 states that stress corrosion cracking of high strength steel closure bolting in an air with steam or water leakage environment is not managed for auxiliary systems at PINGP because they do not exist at PINGP. Furthermore, the applicant states that the conditions leading to SCC, including use of lubricants containing molybdenum disulfide, and high yield strength materials (>150 ksi) do not exist at PINGP. The staff reviewed the applicant's justification, and verified that although there are bolts with yield strength of 130 ksi in the Nuclear Steam Supply System component supports, and are conservatively treated by the applicant as high strength bolts, there are no high strength bolts in the plants auxiliary systems. Furthermore, the staff reviewed LRA Section B2.1.6 "Bolting Integrity Program" and found that the program includes preventive measures for lubricant control in accordance with the recommendations in EPRI NP-5769. Therefore, the staff finds that this is acceptable because it adequately considers the GALL Report recommendations for the Bolting Integrity Program. On this basis, the staff finds the criterion in SRP-LR Section 3.3.2.2.4.4 does not apply.

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 3.3.2.2.5.1 addresses hardening and loss of strength due to elastomer degradation that could occur in seals and components of HVAC and other plant systems exposed to plant indoor air-uncontrolled (internal or external), primary containment air, raw water and treated water environments. The applicant stated that these aging effects are managed with the External Surfaces Monitoring Program. In a letter dated December 16, 2008, the applicant added additional line items as a result of its response to RAI 2.3.3.5-04. The staff noted that these line items are flex connections made of ethylene propylene diene monomer (EPDM) and are managed with the External Surfaces Monitoring Program. The External Surfaces Monitoring Program includes periodic system inspections and walk downs to visually inspect accessible external surfaces for degradation. The applicant also stated that the External Surfaces Monitoring Program is credited with managing aging effects of internal surfaces where the external surfaces are subject to the same environment or stressor as the internal surfaces such that that external condition is representative of the internal surface condition. The applicant stated that this program assures the intended function of affected components will be maintained during the period of extended operation. The applicant further stated that it added change in material properties due to ultraviolet radiation and ozone exposure and, cracking due to ultraviolet radiation and ozone exposure for non-metallic, both elastomers and plastics (PVC, fiberglass, neoprene, rubber, etc.), in these environments.

The staff reviewed LRA Section 3.3.2.2.5.1 and the line items included in letter dated December 16, 2008, against the following criteria in SRP-LR Section 3.3.2.2.5.1, which states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of heating and ventilation systems exposed to air - indoor uncontrolled (internal/external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff reviewed the External Surfaces Monitoring Program in SER Section 3.0.3.2.5. The program is a condition monitoring program that implements inspections and walkdowns of systems and components within the scope of the program. The staff confirmed that in the applicant's response to RAI B2.1.14-1, which was submitted in a letter dated November 5, 2008, the applicant amended the scope of its External Surfaces Monitoring Program, as applied to the management of cracking, hardening, and loss of strength in elastomeric components to include physical manipulation testing in addition to the visual examinations that will be performed on these components. On the basis that the applicant will perform periodic inspections and walk downs of the elastomeric components with appropriate physical manipulation tests, the staff determines that External Surfaces Monitoring Programs is an acceptable program to credit for the management of hardening and loss of strength in these elastomeric components through the period of extended operation.

Based on the program identified above, the staff concludes that the applicant's program meets the SRP-LR Section 3.3.2.2.5.1 criteria. For those line items that apply to LRA Section 3.3.2.2.5.1, 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).

(2) LRA Section 3.3.2.2.5.2 addresses hardening and loss of strength due to elastomer degradation that could occur in elastomer lining exposed to treated water or treated borated water. The applicant stated that it does not have any elastomer-lined components in the Spent Fuel Pool Cooling and Cleanup System that are exposed to treated water or treated borated water.

The staff reviewed LRA Section 3.3.2.2.5.2 against the criteria in SRP-LR Section 3.3.2.2.5.2, which 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) that are exposed to treated water or treated borated water. The staff reviewed the UFSAR and verified that the components in the Spent Fuel Pool Cooling and Cleanup Systems are not lined with protective elastomeric materials. On the basis that the Spent Fuel Pool Cooling and Cleanup Systems do not include any components lined with internal elastomer linings, the staff finds acceptable the applicant has provided an acceptable basis for concluding that the guidance in SRP-LR Section 3.3.2.2.5.2 is not applicable to the LRA.

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

LRA Section 3.3.2.2.6 states that reduction of neutron-absorbing capacity and loss of material due to general corrosion could occur in boral, boron steel spent fuel storage racks neutron absorbing sheets exposed to treated water, or treated borated water. In addition, the LRA states that PINGP does not have boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water."

LRA Table 3.3.1 line item 3.3.1-13, which pertains to Boral, states the following:

> "This line item is not applicable to PINGP. PINGP does not have boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water. Further evaluation is documented in Section 3.3.2.2.6."

Also in LRA Table 3.3.1 line item 3.3.1-87, which pertains to Boraflex, states the following:

> "This line item is not applicable to PINGP. The UFSAR states that Boraflex neutron-absorbing sheet material is not credited in the spent fuel pool criticality analysis. Therefore since this component does not perform any intended function, it is not in scope of License Renewal and requires no further review."

The staff has reviewed LRA Section 3.3.2.2.6 and Table 3.3.1 line item 3.3.1-13 and has confirmed that the PINPG spent fuel pool design does not utilize boral or boron steel neutron absorption materials in their spent fuel storage rack designs. Therefore, the staff finds that Section 3.3.2.2.6 and Table 3.3.1 line item 3.3.1-13 are not applicable to the applicant's LRA and that the applicant's rationale is acceptable.

The staff has reviewed Table 3.3.1 line item 3.3.1-87 and in RAI 3.3.2.2.6-1 dated November 25, 2008, asked the applicant to describe how the potential degradation of Boraflex would be identified in the case that material degradation may impede safe fuel handling if blistering and/or bulging occurs.

In its response by letter dated December 11, 2008, the applicant provided the following:

> The spent fuel storage racks are described in the PINGP UFSAR, Section 10.2.1. Criticality is prevented by the design of the racks which limits fuel assembly interaction by fixing the minimum separation between assemblies, and by maintaining soluble neutron poison in the spent fuel pool water. No mitigative strategy is required for monitoring the spent fuel pool Boraflex material used in the design of spent fuel storage rack fuel module assemblies. The design of the PINGP spent fuel storage rack fuel module assemblies allows for the release of gasses created by the degrading Boraflex material without degrading the surrounding stainless steel material.
>
> The spent fuel storage rack fuel module assembly design at PINGP incorporates Boraflex which differs from the design that incorporates Boral™. Boraflex is a material composed of 46% silica, 4% polydimethyl, and 50% boron carbide. The

> fuel module assemblies consist of an inner stainless steel casing, a layer of Boraflex neutron absorbing material, and an outer stainless steel casing. The inner and outer square stainless steel casings are tubular. The outer casing holds the Boraflex in place and is only one-quarter the thickness of the inner casing. The outer casing is attached to the inner casing by four spot welds at the top and bottom of the outer casing on each of the four sides. Thus, the outer casing is not leak tight. This vented cavity design allows the release of gasses and ingress of water to alleviate the potential for cell wall bulging as a result of the Boraflex material off gassing.
>
> Industry OE indicates that Boraflex degrades over time, but the degradation process does not impede the ability to remove or accept fuel since the fuel module assembly's open flow design allows gasses to vent safely to the spent fuel pool water. Bulging, blistering, or other deformation, known to occur in poorly vented designs, is not applicable at PINGP.

The staff has reviewed the applicant's response to the RAI, and finds it to be acceptable since the racks are vented and this will prevent blistering and/or bulging to occur. Without the possibility of blister and/or bulging, the staff finds acceptable the applicant's rationale that no mitigative strategy is necessary and that fuel handling will not be impeded.

On the basis of its review of the LRA Section 3.3.2.2.6 and Table 3.3.1 line item 3.3.1-13, the staff has determined that these items are not applicable to PINGP and finds the licensee's rationale to be acceptable as stated above.

On the basis of its review of Table 3.3.1 line item 3.3.1-87 and the response to RAI 3.3.2.2.6-1, the staff has determined that a Boraflex Monitoring Program is not necessary, there is adequate assurance that fuel handling will not be impeded in the period of life extension and finds the licensee's rationale to be acceptable as stated above.
as required by 10 CFR 54.21(a)(3).

3.3.2.2.7 Loss of Material Due to General, Pitting, and Crevice Corrosion

(1) The applicant states in LRA Section 3.3.2.2.7.1, Part I that the loss of material due to general, pitting, and crevice corrosion could occur in steel components exposed to lubricating oil. LRA Section 3.3.2.2.7.1, Part I further states that 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results, and 3) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation and the One-Time Inspection Program performs sampling inspections using NDEs techniques that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.3.2.2.7.1, Part I against the criteria in SRP-LR Section 3.3.2.2.7.1, which states that loss of material due to general, pitting, and crevice corrosion could occur in steel piping, piping components, and piping elements including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil (as part of the fire protection system). SRP-LR Section 3.3.2.2.7.1 states that the existing AMP relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. SRP-LR Section 3.3.2.2.7.1 further states that the effectiveness of lubricating oil control should be verified to ensure that corrosion is not occurring and one-time inspection of selected components at susceptible locations is an acceptable method to use to ensure that corrosion is not occurring.

SRP-LR Section 3.3.2.2.7.1, AMR item 14 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.E1-19 (Chemical and Volume Control System), VII.F1-19 (Control Room and Miscellaneous Area Ventilation System), VII.C1-17 (Cooling Water System, Water Treatment System), VII.H2-20 (Diesel Generators and Support System) and VII.G-22 (Fire Protection System) are applicable to loss of material due to general, pitting, and crevice corrosion of steel piping, piping component, and piping elements exposed to lubricating oil. These components are identified in LRA Table 3.3.2-2: Pump Casings, Tanks, LRA 3.3.2-5: Pump Casings, Piping/Fittings, LRA 3.3.2-6: Piping/Fittings, LRA 3.3.2-21: Pump Casings, Piping/Fittings.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to general, pitting and crevice corrosion and 2) will perform one-time inspections of select steel piping, piping components, piping elements, and tanks exposed to lubricating oil for loss of material due to general, pitting, and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program in applicable Auxiliary Systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item VII.C1-17 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.7.1.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.7.1 criteria. For those line items that are addressed in LRA Section 3.3.2.2.7.1, Part I, 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 3.3.2.2.7.1, Part II refers to LRA Section 3.3.2.2.7.1, Part I. LRA Section 3.3.2.2.7.1, Part I states that 1) the loss of material due to general, pitting, and crevice corrosion could occur in steel components exposed to lubricating oil, 2) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program, 3) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results, 4) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation, and 5) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.3.2.2.7.1, Part I against the criteria in SRP-LR Section 3.3.2.2.7.1. SRP-LR Section 3.3.2.2.7.1, invokes AMR item 15 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.G-26 (Fire Protection System) as applicable to loss of material due to general, pitting, and crevice corrosion of steel piping, piping component, and piping elements including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil. These components are identified in LRA Table 3.3.2-9: RCP Oil Collection components.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to general, pitting and crevice corrosion and 2) will perform one-time inspections of select steel piping, piping components, piping elements, and tanks exposed to lubricating oil for loss of material due to general, pitting, and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program in applicable Auxiliary systems. The GALL Report states that one-time inspection is acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item VII.G-26 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.7.1.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.7.1 criteria. For those line items that are addressed in LRA Section 3.3.2.2.7.1, Part II, 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).

The applicant states in LRA Section 3.3.2.2.7.1, Part III that loss of material due to general, pitting, and crevice corrosion could occur in the steel reactor coolant pump oil collection system tank exposed to lubricating oil. LRA Section 3.3.2.2.7.1, Part III further states that 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program, 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results 3) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation and 4) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions.

SRP-LR Section 3.3.2.2.7.1, invokes AMR item 16 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.G-27 (Chemical and Volume Control System) as applicable to loss of material due to general, pitting, and crevice corrosion of steel piping, piping component, and piping elements including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil. These components are identified in LRA Table 3.1.2-2: Tanks.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to general, pitting and crevice corrosion and 2) will perform one-time inspections of steel reactor coolant pump oil collection system tanks exposed to lubricating oil for loss of material due to general, pitting, and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program in applicable Auxiliary systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item VII.G-27 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.7.1.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.7.1 criteria. For those line items that are addressed in LRA Section 3.3.2.2.7.1, Part III, 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).

(2) LRA Section 3.3.2.2.7.2 indicates that the item addressed by SRP-LR 3.3.2.2.7.2 is a BWR item, and therefore not applicable to PINGP.

SRP-LR Section 3.3.2.2.7.2 states that loss of material due to general, pitting, and crevice corrosion of steel piping components, and piping elements exposed to treated water in the BWR reactor water cleanup and shutdown cooling systems.

The staff notes that PINGP is a PWR, and therefore does not have BWR reactor water cleanup and shutdown cooling systems. On this basis, the staff finds the criteria in SRP-LR 3.3.2.2.7.2 do not apply to PINGP.

(3) LRA Section 3.3.2.2.7.3 addresses loss of material due to general (steel only), pitting and crevice corrosion in steel and stainless steel diesel engine exhaust piping, piping components and piping elements exposed to diesel exhaust. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program will manage this aging effect in steel and stainless steel internal surfaces exposed to diesel exhaust.

The staff reviewed LRA Section 3.3.2.2.7.3 against the criteria in SRP-LR Section 3.3.2.2.7.3, which states that loss of material due to general (steel only), pitting and crevice corrosion in steel and stainless steel diesel engine exhaust piping, piping components and piping elements exposed to diesel exhaust can occur and recommends further evaluation of a plant-specific AMP to ensure this aging effect is adequately managed.

The GALL Report, under item VII.H2-2 recommends that a plant-specific program be credited to manage loss of material due to pitting and crevice corrosion for steel piping, piping components and piping elements in the Auxiliary Systems.

The staff verified that only piping, fittings, muffler, silencers and flex connections that align to GALL AMR VII.H2-2 for the Auxiliary System –Diesel Generator and Support System that are fabricated from steel and stainless steel materials are applicable to PINGP that credit this program.

The staff's review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Sections 3.0.3.1.13. The applicant stated that this is a new PINGP program that will perform periodic visual inspections of the internal surfaces of components to manage loss of material due to general (steel only), pitting and crevice corrosion. The staff finds that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program performs visual inspections of internal surfaces of components during periodic system and component surveillance activities or during maintenance activities when the internal surface becomes accessible for visual inspections to detect aging effects that could result in a loss of the component's intended function The staff also determined that the periodic visual inspections will be capable of detecting deterioration or degradation on the material surface that would be an indication of loss of material due to general, pitting and crevice corrosion.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.3.2.2.7.3 criteria. For those line items that are addressed in LRA Section 3.3.2.2.7.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The applicant states in LRA Section 3.3.2.2.8 that the loss of material due to general, pitting, crevice corrosion, and MIC could occur for steel piping, piping components, and piping elements buried in soil regardless of the presence of pipe coatings or wrappings and that this aging effect is managed with the Buried Piping and Tanks Inspection Program. LRA Section 3.3.2.2.8 further states that the Buried Piping and Tanks Inspection Program includes preventive measures to mitigate degradation (e.g., coatings and wrappings required by design) and visual inspections of external surfaces of buried piping components, when excavated, for evidence of coating damage and degradation and these inspections either verify that unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.3.2.2.8 against the criteria in SRP-LR Section 3.3.2.2.8, which states that loss of material due to general, pitting, crevice corrosion, and MIC could occur for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. SRP-LR Section 3.3.2.2.8 further states that 1) the buried piping and tanks inspection program relies 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 and 2) 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 is not occurring.

SRP-LR Section 3.3.2.2.8 invokes AMR item 19 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.H1-9 (Diesel Fuel Oil System) and VII.G-25 (Fire Protection System) as applicable to loss of material due to general, pitting, crevice, and MIC of steel piping, piping component, piping elements, and tanks exposed to soil. These components are identified in LRA Table 3.3.2-10: Piping and Fittings, and LRA Table 3.3.2-9: Piping and Fittings, Valve Bodies.

The staff reviewed LRA Appendix B, Sections B2.1.8, "Buried Piping and Tanks Inspection" in SER Section 3.0.3.1.7 and found that this program provides focused or opportunistic excavations and inspections for general, pitting, crevice, and MIC of buried steel piping and tanks within 10 years before the period of extended operation and within 10 years after the initiation of the period of operation. The staff finds that these activities are consistent with industry practice because this program include for periodic excavations and visual inspections of buried piping and tanks for general, pitting and crevice corrosion and MIC.

The GALL AMP XI.34 program element "parameters monitored/inspected" states that parameters such as coating and wrapping integrity, that are directly related to corrosion damage, of the external surface of buried steel piping and tanks should be monitored. The staff noted that the applicant is crediting the Buried Piping and Tanks Inspection Program as recommended in GALL AMR items VII.H1-9 and VII.G-25 which the GALL Report states is an acceptable program to monitor possible corrosion damage to the external surface of piping and tanks. Therefore, the staff finds that, based on the program identified above, the applicant meets the criteria of SRP-LR Section 3.3.2.2.8.

Based on the programs identified, the staff concludes that the applicant's program meets SRP-LR Section 3.2.2.2.8 criteria. For those line items that are addressed in 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).

3.3.2.2.9 Loss of Material Due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

Steel Piping, Piping Components, Piping Elements, and Tanks Exposed to Fuel Oil. The applicant states in LRA Section 3.3.2.2.9.1 that loss of material due to general, pitting, crevice corrosion, MIC and fouling could occur for steel piping, piping components, piping elements, and tanks exposed to fuel oil. LRA Section 3.3.2.2.9.1 further states that 1) this aging effect is managed with a combination of the Fuel Oil Chemistry Program and the One-Time Inspection Program 2) the Fuel Oil Chemistry Program includes periodic sampling and testing of fuel oil, integrity testing, visual inspection and one-time inspections of selected components to assure the continued effectiveness of fuel oil chemistry control activities to ensure that degradation is not occurring and 3) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.3.2.2.9.1 against the criteria in SRP-LR Section 3.3.2.2.9.1 which states that loss of material due to general, pitting, crevice corrosion, MIC, and fouling could occur for steel piping, piping components, piping elements, and tanks exposed to fuel oil. SRP-LR Section 3.3.2.2.9.1 further states that 1) the existing AMP relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination to manage loss of material due to corrosion or fouling, 2) corrosion or fouling may occur at locations where contaminants accumulate and 3) the effectiveness of the fuel oil chemistry control should be verified to ensure that corrosion is not occurring.

SRP-LR Section 3.3.2.2.9.1, AMR item 20 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.H2-24 (Emergency Diesel Generator System) and VII.H1-10 (Diesel Fuel) as applicable to loss of material due to pitting, crevice, and MIC of steel, piping, piping components, and piping elements exposed to fuel oil. These components are identified in LRA Table 3.3.2-8: Piping and Fittings, Filter / Strainer Housings, Pump Casings, Tanks, Valve Bodies.

The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, crevice corrosion, MIC, and fouling to verify the effectiveness of the Fuel Oil Chemistry program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed LRA Appendix B, Sections B2.1.19, "Fuel Oil Chemistry" and B2.1.29, "One-Time Inspection" in SER Sections 3.0.3.2.9 and 3.0.3.1.18 respectively and found that these programs 1) provide for periodic sampling of fuel oil and periodic, draining, cleaning and visual inspection of fuel tanks to maintain contaminants at acceptable limits to preclude loss of material due to pitting and corrosion and 2) one-time inspections of select steel piping, piping components, piping elements, and tanks exposed to fuel oil for loss of material due to general, pitting, crevice corrosion, MIC and fouling to verify the effectiveness of the Fuel Oil Chemistry Program in applicable Auxiliary systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of mitigative aging management and condition monitoring programs. The staff noted that the Fuel Oil Chemistry provides for both mitigation of aging and condition monitoring of fuel oil tanks. The staff noted that the applicant is crediting the

Fuel Oil Chemistry Program as recommended in GALL AMR items VII.H2-24 and VII.H1-10 and the applicant is verifying effectiveness of the Fuel Oil Chemistry Program with the elements of the One-Time Inspection Program, which is also consistent with the recommendations in GALL AMR items VII.H2-24 and VII.H1-10. Therefore, the staff finds that, based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.3.2.2.9.1.

Based on the applicant's programs discussed above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.9.1 criteria. For those line items that apply to LRA Section 3.3.2.2.9.1, 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).

Steel Heat Exchanger Components Exposed to Lubricating Oil. The applicant states in LRA Section 3.3.2.2.9.2 that loss of material due to general, pitting, crevice, MIC, and fouling could occur for steel heat exchanger components exposed to lubricating oil. PINGP excludes loss of material due to fouling or MIC in a lubricating oil environment based on plant-specific OE. LRA Section 3.3.2.2.9.2 further states that 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results 3) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation and, 4) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.3.2.2.9.2 against the criteria in SRP-LR Section 3.3.2.2.9.2 which states that loss of material due to general, pitting, crevice, MIC, and fouling could occur for steel heat exchanger components exposed to lubricating oil. SRP-LR Section 3.3.2.2.9.2 further states that 1) the existing AMP relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion 2) the effectiveness of lubricating oil control should be verified to ensure that corrosion is not occurring and 3) the GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the oil control program such as a one-time inspection of selected components at susceptible locations.

SRP-LR Section 3.3.2.2.9.2, AMR item 21 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.H2-5 (Emergency Diesel Generator System) are applicable to loss of material due to general, pitting, crevice, and MIC and fouling of steel heat exchanger components, exposed to lubricating oil. These components are identified in LRA Table 3.3.2-6: Chiller Components, LRA Table 3.3.2-8: Heat Exchanger Components.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to general, pitting, and crevice corrosion and 2) will perform one-time inspections of select steel heat exchanger components for loss of material due to general, pitting and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program in applicable Auxiliary systems. The staff noted that the applicant does not specifically manage loss of material due to MIC and fouling; however the control of contaminants in the lubrication oil in conjunction with One-Time Inspection Program will manage the aging effect, loss of material, regardless of the aging mechanism. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item VII.H2-5 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.3.2.2.9.2.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.9.2 criteria. For those line items that apply to LRA Section 3.3.2.2.9.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 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 3.3.2.2.10.1 addresses loss of material due to pitting and crevice corrosion for steel piping, piping components, and piping elements with either elastomer liners or stainless steel cladding exposed to treated water and treated borated water in the spent fuel pool cooling and cleanup system. In LRA Section 3.3.2.2.10.1 the applicant stated that its spent fuel pool cooling and cleanup components do not have elastomer lining. In LRA Table 3.3.1, AMR item number 3.3.1-22, the applicant designated the item as not applicable and stated that the spent fuel pool cooling and cleanup components do not have steel with elastomer lining or stainless steel cladding piping and piping elements exposed to treated water or treated borated water.

    The staff reviewed LRA Section 3.3.2.2.10.1 against the criteria of SRP-LR Section 3.3.2.2.10.1, which states that loss of material due to pitting and crevice corrosion could occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding that are exposed to treated water and treated borated water if the cladding or lining is degraded.

    SRP-LR Section 3.3.2.2.10.1, AMR item 22 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.A3-9 are applicable for steel spent fuel cleanup and cooling system piping and piping components with either internal elastomeric liners or stainless steel cladding that are exposed to a treated borated water environment. The SRP-LR section identifies that, for these material environmental combinations, the GALL Report recommends the Water Chemistry Program be credited for aging management of loss of material in the steel components if the liners or cladding is breached and that a condition monitoring program be credited to verify the effectiveness of the Water Chemistry Program.

The staff reviewed the description of the spent fuel storage pool in PINGP UFSAR Section 10.2.1.2.1.c and of the spent fuel pool cooling system in PINGP UFSAR Section 10.2.2.2. The staff confirmed that the UFSAR description says that all piping in contact with spent fuel pool water is austenitic stainless steel, and there is no description of elastomer lined or stainless steel clad piping or piping components. The staff noted that stainless steel piping and piping components exposed to treated water and borated treated water in the spent fuel pool cooling system and with an aging effect of loss of material due to pitting and crevice corrosion are evaluated in LRA Table 3.3.1, AMR item number 3.3.1-91. On the basis that the applicant has no steel piping or components with elastomer lining or stainless steel cladding in the spent fuel pool cooling and cleanup system, and stainless steel pipes with the same environment and aging effect are evaluated elsewhere in the LRA for the auxiliary systems, the staff finds it acceptable that the applicant designated LRA Table 3.3.1, AMR item 3.3.1-22, as an AMR item that is not applicable to the LRA.

(2) LRA Section 3.3.2.2.10.2 addresses loss of material due to pitting and crevice corrosion for stainless steel and aluminum piping, piping components, and piping elements exposed to treated water in the auxiliary systems. In LRA Section 3.3.2.2.10.2 the applicant stated that all of the GALL Report line items that refer to this SRP-LR section are applicable only for BWR plants. In Table 3.3.1, the applicant stated that AMR items 3.3.1-23 and 3.3.1-24 apply to BWRs only.

SRP-LR Section 3.3.2.2.10.2 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. This SRP-LR section states that the existing AMP relies on monitoring and control of water chemistry to manage the aging effects. However, the SRP-LR section clarifies that high concentration of impurities at crevices and locations of stagnant flow conditions could cause pitting, or crevice corrosion, and therefore recommends that the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The SRP-LR section states that the GALL Report recommends further evaluation of programs to verify effectiveness of the Water Chemistry Program to mitigate loss of material from pitting and crevice corrosion, and states that a one-time inspection of selected components at susceptible locations is an acceptable verification program.

SRP-LR Section 3.3.2.2.10.2, AMR items 23 and 24 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.A4-2, VII.A4-5, VII.A4-11, VII.E3-7, VII.E3-15, VII.E4-4, VII.E4-5, and VII.E4-14 are applicable for components in BWR spent fuel pool cooling and cleanup systems, BWR reactor water cleanup systems, and the BWR shutdown cooling systems (i.e., for older BWR design models that have shutdown cooling systems instead of residual heat removal systems).

The staff reviewed all line items in the GALL Report that refer to this SRP section and confirmed the applicant's claim that the items in the GALL Report apply only to BWRs.

The staff also noted that PWR line items with the same material, environment and aging effect are evaluated under LRA Table 3.3.1, AMR item 3.3.1-91, which is designated in the GALL Report as applicable to PWRs only. The staff's evaluation of LRA AMR item 3.3.1-91 is in SER Section 3.3.2.1. On the basis that all line items in the GALL Report referencing SRP-LR Section 3.3.2.2.10.2 are applicable only to BWRs, and that the corresponding AMR item for the applicant's PWR design are provided in LRA Table 3.3.1, AMR item 3.3.1-91 and is evaluated in SER Section 3.3.21, the staff finds it acceptable that the applicant designated LRA Table 3.3.1, AMR items 3.3.1-23 and 3.3.2-24 as AMR items that are not applicable.

(3) LRA Section 3.3.2.2.10.3 addresses loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation (external) in the heating, ventilation, and air conditioning (HVAC) and other systems. By letter dated April 13, 2009, the applicant submitted its annual update to the LRA. The applicant stated that heat exchanger tubes in certain ventilation air coolers are normally in service and may potentially be exposed to condensation. The applicant further stated that these components should have been evaluated for an external environment of wet air/gas (external), but were incorrectly evaluated for plant indoor air – uncontrolled (external) or primary containment air (external). The staff noted that exposure to condensation may result in aging related degradation that was not initially accounted for when these components were evaluated for a plant indoor air - uncontrolled or primary containment air environment. The applicant stated that this aging effect is managed with the External Surfaces Monitoring Program.

SRP-LR Section 3.3.2.2.10.3 states that loss of material due to pitting and crevice corrosion may occur in copper alloy HVAC piping, piping components, and piping elements exposed to condensation (external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage loss of material due to pitting and crevice corrosion for copper alloy heat exchanger tubes exposed to the external wet air/gas (external) environment addressed by this AMR because a visual inspection will be capable of detecting corrosion wastage, discoloration, and surface discontinuities and pitting that are indicative of loss of material on the accessible external surface of the copper alloy heat exchanger tube. On the basis that External Surfaces Monitoring Program includes periodic visual inspections being during system walkdowns at a specified frequency for managing heat transfer degradation due to fouling, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.3.2.2.10.3 criteria. For those line items that apply to LRA Section 3.3.2.2.10.3, 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).

(4) The applicant states in LRA Section 3.3.2.2.10.4 that loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components and piping elements exposed to lubricating oil. LRA Section 3.3.2.2.10.4 further states that 1) PINGP excludes loss of material due to fouling or MIC in a lubricating oil environment based on plant-specific OE, 2) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program, 3) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results to maintain oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation, and 4) the One-Time Inspection Program either verifies unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.3.2.2.10.4 against the criteria in SRP-LR Section 3.3.2.2.10.4 that states that loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to lubricating oil. SRP-LR Section 3.3.2.2.10.4 further states that 1) the GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil program and 2) a one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring.

SRP-LR Section 3.3.2.2.10.4, AMR item 26 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.E1-12 (Chemical and Volume Control System) and VII.H2-10 (Emergency Diesel Generator System) as applicable to loss of material due to pitting and crevice corrosion of copper alloy piping, piping components, and piping elements exposed to lubricating oil. These components are identified in LRA Table 3.3.2-2: Piping / Fittings, Valve Bodies, LRA Table 3.3.2-5: Piping / Fittings, and LRA Table 3.3.2-8: Heat Exchanger Components, Heat Exchanger Tubes, Heaters, and Valve Bodies.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to pitting and crevice corrosion and 2) will perform one-time inspections of select copper alloy piping, piping components, and piping elements exposed to lubricating oil for loss of material due to pitting and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR items VII.E1-12 and VII.H2-10 and that the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.3.2.2.10.4.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.3.2.2.10.4 criteria. For those line items that apply to LRA Section 3.3.2.2.10.4, 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).

(5) LRA Subsection 3.3.2.2.10.5 states that loss of material due to pitting and crevice corrosion could occur for stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation. The applicant stated that this aging effect is managed with the Compressed Air Monitoring Program. The applicant further stated that the Compressed Air Monitoring Program performs periodic air quality sampling, inspections, component functional testing, and leakage testing; and additionally, preventive maintenance is performed at regular intervals to ensure system components continue to operate reliably; thereby ensuring that quality air is supplied to plant equipment. By letter dated April 13, 2009, the applicant submitted its annual update to the LRA. The applicant stated that heat exchanger tubes in certain ventilation air coolers are normally in service and may potentially be exposed to condensation. The applicant further stated that these components should have been evaluated for an external environment of wet air/gas (external), but were incorrectly evaluated for plant indoor air – uncontrolled (external) or primary containment air (external). The staff noted that exposure to condensation may result in aging related degradation that was not initially accounted for when these components were evaluated in a plant indoor air - uncontrolled or primary containment air environment. The applicant stated that this aging effect is managed with the Compressed Air Monitoring Program or the External Surfaces Monitoring Program.

The staff reviewed LRA Section 3.3.2.2.10.5 against the criteria in SRP-LR Section 3.3.2.2.10.5, which 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.

SRP-LR Section 3.3.2.2.10.5 invokes AMR item 27 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.F2-12, applicable to aluminum piping components exposed to condensation in the auxiliary and radwaste area ventilation system, and recommends a plant-specific AMP.

The staff reviewed the Compressed Air Monitoring Program, which includes periodic visual inspection of internal surfaces of piping and heat exchanger components for loss of material and fouling, monitoring of system air quality in accordance with industry standards and guidelines, and is consistent with the GALL AMP XI.M24, "Compressed Air Monitoring." The staff's review of the Compressed Air Monitoring program and its evaluation are documented in SER Section 3.0.3.2.3. On the basis that periodic visual inspection and monitoring of system air quality will be performed, the staff finds that the Compressed Air Monitoring Program will adequately manage loss of material due to pitting and crevice corrosion of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to wetted air in the control building ventilation system, and instrument and control air system through the period of extended operation.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Section 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage loss of material due to pitting and crevice corrosion for aluminum heat exchanger tubes exposed to external wet air/gas (external) environment addressed by this AMR because a visual inspection will be capable of detecting corrosion wastage, discoloration, and surface discontinuities and pitting that are indicative of loss of material on the accessible external surface of the aluminum heat exchanger tube. On the basis that External Surfaces Monitoring Program includes periodic visual inspections at a specified frequency for managing heat transfer degradation due to fouling, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.10.5 criteria. For those line items that apply to LRA Section 3.3.2.2.10.5, 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).

(6) LRA Subsection 3.3.2.2.10.6 states that loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to condensation (internal). The applicant stated that this aging effect is managed with the Compressed Air Monitoring Program. The applicant further stated that the Compressed Air Monitoring Program performs periodic air quality sampling, inspections, component functional testing, and leakage testing; and additionally, preventive maintenance is performed at regular intervals to assure system components continue to operate reliably; thereby assuring that quality air is supplied to plant equipment.

The staff reviewed LRA Section 3.3.2.2.10.6 against the criteria in SRP-LR Section 3.3.2.2.10.6, which states that loss of material due to pitting and crevice corrosion could occur for copper alloy fire protection system components exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure these aging effects are adequately managed.

SRP-LR Section 3.3.2.2.10.6, AMR item 28 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VII.G-9, are applicable to copper alloy piping components exposed to condensation in the fire protection system, and recommends a plant-specific AMP.

LRA Table 3.1.1, line item 3.3.1-28 is referenced in LRA Table 3.3.2-17, station and instrument air system for copper alloy, brass and bronze valve bodies and heat exchanger tubes. The staff reviewed the Compressed Air Monitoring Program, which includes periodic visual inspection of internal surfaces of piping and heat exchanger components for loss of material and fouling, monitoring of system air quality in accordance with industry standards and guidelines, and is consistent with the GALL AMP XI.M24, "Compressed Air Monitoring." The staff's review of the Compressed Air Monitoring Program and its evaluation are documented in SER Section 3.0.3.2.3. On the basis that periodic visual inspection and monitoring of system air quality will be performed, the staff finds that the Compressed Air Monitoring Program will adequately manage loss of material due to pitting and crevice corrosion of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to wetted air in the control building ventilation system, and instrument and control air system through the period of extended operation.

Based on the program identified, the staff concludes that the applicant's program meets the SRP-LR Section 3.3.2.2.10.6 criteria. For those line items that apply to LRA Section 3.3.2.2.10.6, 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).

(7) LRA Section 3.3.2.2.10.7 addresses loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, and piping elements exposed to soil, stating that this aging effect is not applicable because at PINGP, there are no stainless steel piping components exposed to soil in the auxiliary systems.

SRP-LR Section 3.3.2.2.10.7 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 staff verified, through review of the PINGP UFSAR, that the auxiliary system does not contain any stainless steel piping, piping components, and piping elements. On this basis, the staff finds that the criteria in SRP-LR Section 3.3.2.2.10.7 are not applicable to PINGP.

(8) LRA Section 3.3.2.2.10.8 indicates that the aging effect described in SRP-LR Section 3.3.2.2.10.8 is related to BWR plants, and therefore not applicable to PINGP.

SRP-LR Section 3.3.2.2.10.8 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements of the BWR standby liquid control system exposed to sodium pentaborate solution.

The staff noted that PINGP is a PWR, and therefore does not have standby liquid control system. On this basis, the staff finds the criteria in SRP-LR 3.3.2.2.10.8 are not applicable to PINGP.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.10 criteria or else that the applicant has provided an acceptable basis for concluding that a particular recommendation in SRP-LR Section 3.3.2.2.10 is either not applicable to the LRA or did not need to be applied to the LRA. 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 in copper alloy auxiliary system components exposed to a treated water environment, stating that this aging effect is not applicable to PINGP, a PWR plant.

SRP-LR Section 3.3.2.2.11 states that loss of material due to pitting, crevice, and galvanic corrosion may occur in copper alloy piping, piping components, and piping elements exposed to treated water.

The staff noted that all GALL Report AMR items that correspond to SRP-LR Section 3.3.2.2.11 are components in BWR systems, and therefore do not apply to PINGP, a PWR plant.

Based on the above, the staff concludes that SRP-LR Section 3.3.2.2.11 criteria do not apply to the LRA.

3.3.2.2.12 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

(1) LRA Subsection 3.3.2.2.12.1 states that loss of material due to pitting corrosion, crevice corrosion and MIC could occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil. The applicant stated that this aging effect is managed with the Fuel Oil Chemistry Program, the One-Time Inspection Program and the Fire Protection Program. The applicant further stated that the Fire Protection Program provides diesel-driven fire pump inspection activities that require the pump to be periodically performance tested to ensure that the fuel supply line can perform its intended function; and the fuel supply line intended function is confirmed by visually inspecting the diesel engine and its fuel supply line, and by starting and running the diesel-driven fire pump.

    In LRA Table 3.3.2-8 and 3.3.2-10, the applicant clarifies that for the stainless steel and copper alloy piping and fittings in the Diesel Generators and Support System and the Fuel Oil System, the Fuel Oil Chemistry Program is credited to manage loss of material in the components as result of exposing the components to fuel oil and that the One-Time Inspection Program is credited to verify the effectiveness of the Fuel Oil Chemistry Program in managing this aging effect.

    In LRA Table 3.3.2-9, the applicant clarifies that for the copper alloy piping and fittings in the fuel supply line to the diesel-driven fire pumps (i.e. part of the Fire Protection System), the Fuel Oil Chemistry Program is credited to manage loss of material in the component surfaces as a result of exposing the component surfaces to fuel oil and that the One-Time Inspection Program is credited to verify the effectiveness of the Fuel Oil

Chemistry Program in managing this aging effect. For these components, the applicant also clarifies that the Fire Protection Program is conservatively credited as an additional AMP for managing loss of material in the copper alloy piping and fittings in the fuel supply line to the diesel-driven fire pumps.

The staff reviewed LRA Section 3.3.2.2.12.1 against the criteria in SRP-LR Section SRP-LR Section 3.3.2.2.12.1, which 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.

SRP-LR Section 3.3.2.2.12.1, AMR item 32 in Table 3 of the GALL Report, Volume 1, and GALL Report AMR items VII.H1-1, VII.H2-7, VII.G-10, VII.H1-3, VII.H2-9, VII.G-17, VII.H1-6 and VII.H2-16, applicable to stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil in the fire protection, diesel fuel oil, and emergency diesel generator systems, and recommends Fuel oil Chemistry and effectiveness verification program

The staff noted that, for the stainless steel and copper alloy piping and fittings in the Diesel Generators and Support System and the Fuel Oil System, and in the copper alloy piping and fittings in the fuel supply line to the diesel-drive fire protection pumps, the applicant crediting of the Fuel Oil Chemistry Program and One-Time Inspection Program was consistent with the recommendations in GALL AMR items VII.H1-6, VIII.H1-3, VII.H2-16, VII.H2-9, and VII.G-10 that these programs be credited for aging management of loss material in the surfaces that are exposed to the fuel oil environment. Specifically, the staff noted that the Fuel Oil Chemistry Program is designed to monitor for fuel oil quality and the levels of water, sediment, and contaminants, which if present could induce corrosion in components, and that the One-Time Inspection Program is used to verify the effectiveness of the Fuel Oil Chemistry Program and to confirm that aging degradation is not occurring. The staff finds that the applicant has provided an acceptable basis for managing loss of material in the components surfaces that are exposed to fuel oil because the AMPs credited for aging management are in conformance with the AMPs recommended for aging management in SRP-LR Section 3.3.2.2.12.1 and GALL AMR items VII.H1-6, VIII.H1-3, VII.H2-16, VII.H2-9, and VII.G-10.

The staff also noted that in addition to the Fuel Oil Chemistry and One-Time Inspection Programs, the applicant also credits the Fire Protection Program for aging management of copper alloy piping and fittings in the diesel-driven fire pump fuel supply line. The staff reviewed the Fire Protection Program and its evaluation is documented in SER Section

3.0.3.2.6. The staff noted that consistent with GALL Report recommendation, the PINGP Fire Protection Program requires that the diesel driven fire pump be periodically performance tested to ensure that the fuel oil supply line can perform its intended function. The staff also noted that the fuel oil supply line intended function is confirmed by starting and running the diesel-driven fire pump for 30 minutes every week and that the periodic pump performance test provides an indirect means of verifying the absence of fuel line loss of material by confirming satisfactory pump performance. On the basis that the applicant's Fire Protection Program is consistent with the GALL AMP XI.M26, "Fire Protection," and the applicant is crediting the Fuel Oil Chemistry and One-Time Inspection Programs for monitoring chemistry and inspection of the internal surfaces of the diesel-driven fire pump fuel supply line, the staff finds that it is a conservatively acceptable practice to credit the Fire Protection Program as an additional aging management program for managing loss of material due to pitting and crevice corrosion in the copper alloy piping and fittings of the diesel-driven fire pump fuel supply line that are exposed to fuel oil environment.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.12.1 criteria. For those line items that apply to LRA Section 3.3.2.2.12.1, 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).

(2) The applicant states in LRA Section 3.3.2.2.12.2 that loss of material due to pitting, crevice corrosion, and MIC could occur in stainless steel, piping, piping components, and piping elements exposed to lubricating oil. LRA Section 3.3.2.2.12.2 further states that 1) PINGP excludes loss of material due to MIC in a lubricating oil environment based on plant-specific OE, 2) loss of material is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program 3) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results, 4) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation and 5) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.3.2.2.12.2 against the criteria in SRP-LR Section 3.3.2.2.12.2, which states that loss of material due to pitting, crevice corrosion, and MIC could occur in stainless steel piping, piping components, and piping elements exposed to lubricating oil. SRP-LR Section 3.3.2.2.12.2 further states that 1) the existing program relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion and 2) the effectiveness of the lubricating oil program is verified through one-time inspection of selected components at susceptible locations to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

SRP-LR Section 3.3.2.2.12.2, AMR item 33 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VII.E1-15 (Chemical and Volume Control System), VII.H2-17 (Emergency Diesel Generator System) and VII.G-18 (Fire Protection System) are applicable to loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to lubricating oil. These components are identified in LRA Table 3.3.2-2: Piping / Fittings, LRA Table 3.3.2-8: Manifolds, Piping / Fittings, Thermowells, Valve Bodies, LRA Table 3.3.2-9: RCP Oil Collection components.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to pitting, crevice corrosion, and MIC and 2) will perform one-time inspections of select stainless steel piping, piping components, and piping elements exposed to lubricating oil for loss of material due to pitting, crevice corrosion and MIC to verify the effectiveness of the Lubricating Oil Analysis Program in applicable auxiliary systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR items VII.E1-15, VII.H2-17 and VII.G-18, and that the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.3.2.2.12.2.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.3.2.2.12.2 criteria. For those line items that apply to LRA Section 3.3.2.2.12.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.13 Loss of Material Due to Wear

LRA Section 3.3.2.2.13 addresses loss of material due to wear that could occur in elastomer seals and components in an indoor air environment (internal or external). The applicant stated that this aging effect is managed with the External Surfaces Monitoring Program. In a letter dated December 16, 2008, the applicant added additional line items as a result of its response to RAI 2.3.3.5-04. The staff noted that these line items are flex connections made of EPDM and are managed with the External Surfaces Monitoring Program. The External Surfaces Monitoring Program performs periodic system inspections and walkdowns to visually inspect accessible external surfaces for degradation. The applicant also stated that the External Surfaces Monitoring Program is credited with managing aging effects of internal surfaces where the external surfaces are subject to the same environment or stressor as the internal surfaces such that that external condition is representative of the internal surface condition. The applicant concluded that this program assures the intended function of affected components will be maintained during the period of extended operation. The applicant identified that this AMR evaluation is applicable to the management of loss of material in EDPM flexible connections in the auxiliary and radwaste ventilation system, control area and miscellaneous ventilation system, diesel generator ventilation system, and primary containment heating and ventilation system under exposure to either an internal or external indoor air environment.

The staff reviewed LRA Section 3.3.2.2.13 and the line items included in letter dated December 16, 2008, against the criteria in SRP-LR Section 3.3.2.2.13, which 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 of an AMP to ensure that the aging effect is adequately managed. This SRP-LR Section references AMR item 34 in Table 3 of the GALL Report, Volume 1, and AMR items VII.F1-6, VII.F2-6, VII.F3-6, VII.F4-5, VII.F1-5, VII.F2-5, VII.F3-5, and VII.F4-4 in the GALL Report Volume 2, as applicable to the management of loss of material due to wear in elastomeric seals and components in auxiliary and radwaste ventilation system, control area and miscellaneous ventilation system, diesel generator ventilation system, and primary containment heating and ventilation system.

The staff noted that the applicant credited its External Surfaces Monitoring Program to manage loss of material due to wear of these EDPM elastomer flexible connections. The staff's review of the applicant's External Surfaces Monitoring Program is documented in SER Section 3.0.3.2.5. The staff notes that the applicant's External Surfaces Monitoring Program include periodic visual inspections of external surfaces that are periodically performed during system walkdowns of the plant. The staff also noted the ASME Code Section XI lists VT-1 and VT-3 visual inspection methods as acceptable inspection techniques for monitoring for discontinuities in component materials, including those that may be induced by loss of material.

Based on this determination, the staff concludes that the applicant's basis for crediting the External Surfaces Monitoring Program for aging management of loss of material due to wear in these flexible connections is valid because: (1) the program will perform visual examinations of the external surfaces to monitor for discontinuities that are induced by wear, (2) visual VT-1 and VT-3 examination methods are acceptable examination methods for detecting surface breaking discontinuities, such as those that may be induced by wear, and (3) the conforms to the recommendation in SRP-LR Section 3.3.2.2.13 that a valid AMP be evaluated and credited for managing loss of material in elastomeric ventilation system seals and components.

Based on the program identified above, the staff concludes that the applicant's program meets the SRP-LR Section 3.3.2.2.13 criteria. For those line items that apply to LRA Section 3.3.2.2.13, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.14 Loss of Material Due to Cladding Breach

The staff reviewed LRA Section 3.3.2.2.14 against the criteria in SRP-LR Section 3.3.2.2.14.

LRA Section 3.3.2.2.14 addresses cracking due to underclad cracking in PWR steel charging pump casings with stainless steel cladding exposed to treated borated water, stating that this aging effect is not applicable because the charging pump casings are not carbon steel with stainless steel clad but made of stainless steel.

SRP-LR Section 3.3.2.2.14 states that loss of material due to cladding breach (also referred to as underclad cracking may occur in PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references IN 94-63 and recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

Through a review of PINGP UFSAR, the staff verified that charging pump are made of stainless steel and do not have cladding. Therefore, the aging effect of cracking due to underclad cracking in PWR steel charging pumping casings with stainless steel cladding exposed to treated borated water is not applicable to PINGP.

Based on the above, the staff concludes that SRP-LR Section 3.3.2.2.14 criteria do not apply.

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 3.3.2-21, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.3.2-1 through 3.3.2-21, the applicant indicated, via notes F through J that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.3.2.3.1 Auxiliary and Radwaste Area Ventilation System - Summary of Aging Management Review – LRA Table 3.3.2-1

The staff reviewed LRA Table 3.3.2-1, which summarizes the results of AMR evaluations for the auxiliary and radwaste area ventilation system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-1 are consistent with the GALL Report.

3.3.2.3.2 Chemical and Volume Control System - Summary of Aging Management Review – LRA Table 3.3.2-2

The staff reviewed LRA Table 3.3.2-2, which summarizes the results of AMR evaluations for the chemical and volume control system component groups.

LRA Table 3.3.2-2 summarizes the results of an AMR for the Chemical and Volume Control System piping and fittings constructed out of copper alloy exposed to lubricating oil (internal). The applicant proposed an aging effect of loss of material (selective leaching) and proposed the Selective Leaching of Materials Program to manage the aging effect.

The applicant has indicated that generic Note H is applicable for these items with plant-specific Note 318. Generic Note H is “Aging effect not in NUREG-1801 for this component, material, and environment.” Plant-specific note 318 states, “loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil environment.” The staff confirmed that the aging effect for this component, material, and environment is not in the GALL Report for this component, material and environment. The GALL Report lists the aging effect for copper alloy in lubricating oil with no water pooling as none with no AMP required. However, if the copper alloy has greater than 15 percent zinc or greater than 8 percent aluminum, then selective leaching is possible. (M. G. Fontana, *Corrosion Engineering,* Third Edition, McGraw-Hill, New York, 1986.) The GALL Report does not have an AMR line item for copper alloy with greater than 15 percent zinc or greater than 8 percent aluminum exposed to lubricating oil. Because it is possible that the copper alloy has greater than 15 percent zinc or 8 percent aluminum, the staff finds that it is conservative to identify loss of material by selective leaching as the AERM for the LRA and to credit the use of the Selective Leaching of Material Program to manage loss of material that may occur in these components as a result of selective leaching. The staff evaluates the ability of the Selective Leaching Program to manage loss of material due to selective leaching in SER Section 3.0.3.2.15.

LRA Table 3.3.2-2 summarizes the results of an AMR for the Chemical and Volume Control System pump casings constructed out of cast iron exposed to lubricating oil (internal). The applicant proposed an aging effect of loss of material (selective leaching) and proposed the Selective Leaching of Materials Program to manage the aging effect.

The applicant has indicated that generic Note H is applicable for these items with plant-specific note 318. Generic Note H is “Aging effect not in NUREG-1801 for this component, material, and environment.” Plant-specific note 318 states, “Loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil environment.” The staff confirmed that the aging effect for this component, material, and environment is not in GALL for this component, material and environment. Selective leaching of cast iron, also called graphitization is common for cast iron. (M. G. Fontana, *Corrosion Engineering,* Third Edition, McGraw-Hill, New York, 1986.) The iron in the cast iron is selectively leached out leaving the graphite behind. The staff finds that the use of Selective Leaching of Material Program for this component, material, environment combination aging effect is appropriate because the aging effect has previously been identified.

LRA Table 3.3.2-2 summarizes the results of an AMR for the Chemical and Volume Control System valve bodies constructed out of brass exposed to lubricating oil (internal). The applicant proposed an aging effect of loss of material (selective leaching) and proposed the Selective Leaching of Materials Program to manage the aging effect.

The applicant has indicated that generic Note H is applicable for these items with plant-specific note 318. Generic Note H is "Aging effect not in NUREG-1801 for this component, material, and environment." Plant-specific note 318 states, "Loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil environment." The staff confirmed that the aging effect for this component, material, and environment is not in GALL for this component, material and environment. The staff noted that selective leaching is a common aging mechanism for brass materials (refer to M. G. Fontana, *Corrosion Engineering,* Third Edition, McGraw-Hill, New York, 1986). The staff finds that the use of this AMP for this component, material, environment combination aging effect is appropriate because the aging effect has previously been identified.

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 Component Cooling System - Summary of Aging Management Review – LRA Table 3.3.2-3

The staff reviewed LRA Table 3.3.2-3, which summarizes the results of AMR evaluations for the component cooling system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-3 are consistent with the GALL Report.

3.3.2.3.4 Containment Hydrogen Control System - Summary of Aging Management Review – LRA Table 3.3.2-4

The staff reviewed LRA Table 3.3.2-4, which summarizes the results of AMR evaluations for the containment hydrogen control system component groups.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of preload- thermal, gasket creep, loosening for copper alloy bolting and fasteners externally exposed to an uncontrolled plant indoor air environment using the Bolting Integrity Program. 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 AMR line item also cites plant-specific Note 304, which indicates that SCC is not an applicable aging effect/mechanism since there are no bolts with a minimum yield strength > 150 ksi.

The LRA credits the PINGP AMP B2.1.6 "Bolting Integrity Program," to manage this aging effect. The staff's evaluation of the Bolting Integrity Program is documented in SER Section

3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that will manage the loss of preload through periodic inspection and preventive measures. The staff reviewed the Bolting Integrity Program to verify that loss of preload due to thermal effects, gasket creep, and self loosening will be managed in accordance with the recommendations specified by the Bolting Integrity Program. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, they will be adequately managed.

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 Control Room and Miscellaneous Area Ventilation System - Summary of Aging Management Review – LRA Table 3.3.2-5

The staff reviewed LRA Table 3.3.2-5, which summarizes the results of AMR evaluations for the control room and miscellaneous area ventilation system component groups.

In LRA Table 3.3.2-5, the applicant proposed to manage change in material properties due to ozone and ultraviolet exposure and cracking due to ozone and ultraviolet exposure for flex connections fabricated from PVC exposed to an external uncontrolled plant indoor air environment. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment.

The applicant credits PINGP AMP B2.1.14 “External Surfaces Monitoring Program,” for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, “External Surfaces Monitoring” to include non-metallic components, including PVC, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant’s proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant’s response acceptable as documented in the staff’s evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff reviewed the applicant’s External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

By letter dated April 13, 2009, the applicant submitted its annual update to the LRA. The applicant stated that heat exchanger tubes in certain ventilation air coolers are normally in service and may potentially be exposed to condensation. The applicant further stated that this should have been evaluated for an external environment of wet air/gas (external), but were incorrectly evaluated as plant indoor air – uncontrolled (external) or primary containment air (external). The staff noted that exposure to condensation may result in aging related degradation that were not initially accounted when these components were evaluated in a plant indoor air - uncontrolled or primary containment air environment. In LRA Table 3.3.2-5, the applicant proposed to manage heat transfer degradation due to fouling for heat exchanger tubes fabricated from copper alloy exposed to a wet air/gas (external) environment. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The applicable heat exchangers are located within the Control Room and Miscellaneous Area Ventilation System with the external side of the tubes exposed to a wet air/gas (external) environment.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage heat transfer degradation due to fouling for copper alloy heat exchanger tubes exposed to wet air/gas (external) environment addressed by this AMR because a visual inspection will be capable of detecting any fouling (buildup from whatever source) on the external surface of the copper alloy heat exchanger tube. On the basis of periodic visual inspections being performed during system walkdowns at a specified frequency of these components by the PINGP AMP B2.1.14, External Surfaces Monitoring, for heat transfer degradation due to fouling, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-5, the applicant proposed to manage loss of material-selective leaching in copper alloy piping and fittings in an internal environment of lubricating oil and copper alloy heat exchanger tubes in a wet air/gas external environment by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for this line item indicating that the aging effect is not in the GALL Report for these components, material, and environment combinations. The applicant also referenced a plant-specific note, which stated that for this line item loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil environment.

LRA B2.1.36 stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant’s Selective Leaching Program is consistent with the one-time inspection basis credited in the GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that Table IX.C in the GALL Report Volume 2 identifies that copper alloys with greater than 15 percent alloying zinc content, aluminum bronzes with greater than 8 percent Al alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15 percent alloying zinc contents may be susceptible to selective leaching, and (2) basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Programs is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

LRA Table 3.3.2-5 summarizes the results of AMRs for the Control Room and Miscellaneous Area Ventilation System flex connections constructed from PVC and exposed to dry/filtered instrument air (internal). The applicant stated that there are no aging effect and therefore no AMP is required.

The applicant has indicated that generic Note F is applicable for these items with plant-specific note 313. Generic Note F is “[m]aterial not in NUREG-1801 for this component.” Plant-specific note 313 states, “[m]aterials science evaluation for this material in this environment results in no aging effects.” The staff confirmed that this material is not in the GALL Report for this component. 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 PVC is has no aging effect when in contact with dry filtered air (refer to Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956).

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 Cooling Water System - Summary of Aging Management Review – LRA Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of AMR evaluations for the cooling water system component groups.

By letter dated April 13, 2009, the applicant submitted its annual update to the LRA. The applicant stated that heat exchanger tubes in certain ventilation air coolers are normally in service and may potentially be exposed to condensation. The applicant further stated that this should have been evaluated for an external environment of wet air/gas (external), but was incorrectly evaluated as plant indoor air – uncontrolled (external) or primary containment air (external). The staff noted that exposure to condensation may result in aging related degradation that was not initially accounted when these components were evaluated in a plant indoor air - uncontrolled or primary containment air environment. In LRA Table 3.3.2-6, the applicant proposed to manage heat transfer degradation due to fouling for heat exchanger tubes fabricated from copper alloy exposed to a wet air/gas (external) and an external uncontrolled plant indoor air environment with the External Surfaces Monitoring Program. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The applicable heat exchangers are located within the cooling water system with the external side of the tubes exposed to a wet air/gas (external) and an external uncontrolled plant indoor air environment.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage heat transfer degradation due to fouling for copper alloy heat exchanger tubes exposed to wet air/gas (external) and an external uncontrolled plant indoor air environment addressed by this AMR because a visual inspection will be capable of detecting any fouling (buildup from whatever source) on the external surface of the copper alloy heat exchanger tube. On the basis of periodic visual inspections being performed during system walkdowns at a specified frequency of these components by the PINGP AMP B2.1.14, "External Surfaces Monitoring," for heat transfer degradation due to fouling, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-6, the applicant proposed to manage change in material properties and cracking for piping and fittings fabricated from polyvinylidene difluoride (PVDF) and valve bodies fabricated from PVC exposed to an external uncontrolled plant indoor air environment with the External Surfaces Monitoring Program. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment.

The applicant credits PINGP AMP B2.1.14 "External Surfaces Monitoring Program" for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, "External Surfaces Monitoring" to include non-metallic components, including PVDF and PVC, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant's proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant's response acceptable as documented in the staff's evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff reviewed the applicant's External Surfaces Monitoring Program and its evaluation is documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-6, the applicant proposed to manage loss of material due to general corrosion, crevice corrosion, galvanic corrosion, and MIC in carbon steel bolting and fasteners exposed to a buried environment using the Bolting Integrity Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material. The AMR line item also cites Plant-Specific Note 306, which indicates that components that are buried in the ground are analyzed in the same manner as raw water (damp soil containing groundwater).

The LRA credits the PINGP AMP B2.1.6 "Bolting Integrity Program," to manage this aging effect. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that will manage the loss of material for buried bolts and fasteners through the implementation of the Buried Piping and Tanks Inspection Program. This program is documented in PINGP LRA AMP B2.1.8, "Buried Piping and Tanks Inspection Program." The staff's evaluation of the Buried Piping and Tanks Inspection Program is documented in SER Section 3.0.3.1.7. The staff reviewed the Buried Piping and Tanks Inspection Program to verify that loss of material for buried carbon steel bolts and fasteners will be managed in accordance with the recommendations specified by the Bolting Integrity Program. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, which are implemented by the Buried Piping and Tanks Inspection Program, they will be adequately managed.

In LRA Table 3.3.2-6, the applicant proposed to manage loss of preload due to thermal gasket creep, and loosening for carbon steel bolting and fasteners exposed to a buried environment using the Bolting Integrity Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material. The

AMR line item also cites Plant-Specific Note 306, which indicates that components that are buried in the ground are analyzed in the same manner as raw water (damp soil containing groundwater).

The LRA credits the PINGP AMP B2.1.6 “Bolting Integrity Program,” to manage this aging effect. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that will manage the loss of preload for buried bolts and fasteners through the implementation of the Buried Piping and Tanks Inspection Program. This program is documented in PINGP LRA AMP B2.1.8, “Buried Piping and Tanks Inspection Program.” The staff’s evaluation of the Buried Piping and Tanks Inspection Program is documented in SER Section 3.0.3.1.7. The staff reviewed the Buried Piping and Tanks Inspection Program to verify that loss of preload for buried carbon steel bolts and fasteners will be managed in accordance with the recommendations specified by the Bolting Integrity Program. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, which are implemented by the Buried Piping and Tanks Inspection Program, they will be adequately managed.

LRA Table 3.3.2-6 summarizes the results of AMRs for the cooling water system valve bodies constructed from PVC exposed to raw water (internal). The applicant proposed no aging effect and therefore states that no AMP is required.

The applicant has indicated that Generic Note F is applicable for these items with Plant-Specific note 313. Generic Note F is “Material not in NUREG-1801 for this component.” Plant-Specific note 313 states, “Materials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this material is not in the GALL Report for this component. 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 PVC is has no aging effect when in contact with raw water (Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956.)

In LRA Table 3.3.2-6, the applicant proposed to manage loss of material-selective leaching in copper alloy heat exchanger tubes in a wet air/gas external environment by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for this line item indicating that the aging effect is not in the GALL Report for these components, material, and environment combinations.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.16. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant’s Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that Table IX.C in the GALL Report Volume 2 identifies that copper alloys with greater than 15 percent alloying zinc content, aluminum bronzes with greater than 8 percent aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15 percent alloying zinc contents may be susceptible to selective leaching, and (2) the basis in GALL AMP XI.M33 which states that the one-time inspection proposed in the Selective Leaching Program is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

In LRA Table 3.3.2-6, the applicant credited its Bolting Integrity Program to manage loss of material due to general corrosion, pitting corrosion, crevice corrosion, galvanic corrosion, and MIC for carbon steel bolting and fasteners that are externally exposed to a raw water environment. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material.

The LRA credits the PINGP AMP B2.1.6, “Bolting Integrity Program,” to manage this aging effect. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The staff noted that the applicant’s Bolting Integrity Program is an existing PINGP program that manages the aging effects of loss of material and loss of preload aging effects for carbon steel bolts and fasteners in a raw water environment. The staff also noted that the applicant accomplishes this through its implementation of the “RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program” which is discussed in PINGP LRA AMP B2.1.35, RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The staff’s evaluation of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is documented in SER Section 3.0.3.2.14. The staff reviewed the RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, to verify that loss of material and loss of preload for carbon steel bolts and fasteners in a raw water environment will be managed in accordance with the recommendations specified by the Bolting Integrity Program. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, which are implemented by the RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, they will be adequately managed.

On the basis of its review for the cooling water system components, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.7 Diesel Generator and Screenhouse Ventilation System - Summary of Aging Management Review – 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 generator and screenhouse ventilation system component groups.

In LRA Table 3.3.2-7, the applicant proposed to manage change in material properties due to ozone and ultraviolet exposure and cracking due to ozone and ultraviolet exposure for tanks fabricated from acrylonitrile-butadiene stryene (ABS) rubber exposed to an external uncontrolled, plant indoor air environment. The External Surfaces Monitoring Program manages this AMR line item. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment.

The applicant credits PINGP AMP B2.1.14, “External Surfaces Monitoring Program,” for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, “External Surfaces Monitoring” to include non-metallic components, including ABS, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant’s proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant’s response acceptable as documented in the staff’s evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff’s review of the applicant’s External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify that aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

LRA Table 3.3.2-7 summarizes the results of AMRs for the piping and fittings constructed from ABS and exposed to raw water (internal). The applicant proposed no aging effect and therefore stated that no AMP is required.

The applicant has indicated that Generic Note F is applicable for these items with plant-specific Note 313. Generic Note F is "[m]aterial not in NUREG-1801 for this component." Plant-specific Note 313 states, "[m]aterials science evaluation for this material in this environment results in no aging effects. The staff confirmed that this material is not in the GALL Report for this component. 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 ABS has no aging effect when exposed to raw water. (Harper C.A., Handbook of plastic and elastomers, McGraw-Hill, New York, 1975, pp. 1-3,1-62, 2-42, 3-1.)

On the basis of its review for the diesel generator and screenhouse ventilation system components, 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 Diesel Generator and Support System - Summary of Aging Management Review – LRA Table 3.3.2-8

The staff reviewed LRA Table 3.3.2-8, which summarizes the results of AMR evaluations for the diesel generator and support system component groups.

In LRA Table 3.3.2-8, the applicant proposed to manage change in material properties due to thermal exposure and cracking due to thermal exposure for flex connections fabricated from natural rubber exposed to an internal treated water environment. The External Surfaces Monitoring Program manages these AMR line items. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The applicant credits PINGP AMP B2.1.14, "External Surfaces Monitoring Program," for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, "External Surfaces Monitoring," to include non-metallic components, including natural rubber, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant's proposed augmentation to PINGP AMP B2.1.14. Therefore by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant's response acceptable as documented in the staff's evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

During its review the staff notes that the applicant utilized a plant-specific note which indicates that this program is credited to manage aging of internal surfaces because the external surfaces are subject to the same environment or stressor as the internal surfaces. The staff notes that the applicant's use of this program is consistent with the recommendations in the GALL Report. However, the staff determined that additional information was needed pertaining to the internal and external environments of these natural rubber components. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.3.2-08-01 requesting the applicant to clarify the external environment of these components, and to consider the program's ability to manage aging in non-metallic components. By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-08-01 by stating that the external environment is plant-indoor air – uncontrolled and is not identical to the internal environment of treated water. The applicant further stated the external thermal stressor (i.e., temperature), that can cause cracking and change in material properties for non-metallic components, is the same as the internal environment. The staff notes that the applicant's statement is reasonable because these natural rubber flex connections are not insulated; therefore, the external surface of these components will be representative of the temperature of the internal treated water environment. The staff further notes that the external surface may be subject to ultraviolet and ozone exposure which can contribute to the aging effects of cracking and change in material properties in non-metallic components. Furthermore, the staff notes this additional exposure may potentially create a more aggressive environment on the external surface when compared to the internal environment. On the basis of its review, the staff finds the applicant's response acceptable because the external environment is potentially more aggressive than the internal environment; therefore, the applicant's program, which performs inspections on the external surface of these components, will be representative of the conditions on the external surface.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. Further, the staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-8, the applicant proposed to manage heat transfer degradation due to fouling for heat exchanger tubes fabricated from carbon steel and copper alloy exposed to an external uncontrolled plant indoor air environment. The External Surfaces Monitoring Program manages these AMR line items. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The applicable heat exchangers are located within the diesel generator and support system with the external side of the tubes exposed to an external uncontrolled plant indoor air environment.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage heat transfer degradation due to fouling for carbon steel and copper alloy heat exchanger tubes exposed to external uncontrolled plant indoor air environment addressed by this AMR because a visual inspection will be capable of detecting any fouling (buildup from whatever source) on the external surface of the carbon steel and copper alloy heat exchanger tube. On the basis of periodic visual inspections being performed during system walkdowns at a specified frequency of these components by the PINGP AMP B2.1.14, "External Surfaces Monitoring," for heat transfer degradation due to fouling, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-8, the applicant proposed to manage cracking due to SCC/IGA for piping/ fittings made of copper alloy and for valve bodies made of brass or bronze exposed to a fuel oil environment using the Fuel Oil Chemistry Program and the One-Time Inspection Program. For these AMR results the applicant cited Generic Note H, indicating that the aging effect is not in the GALL Report for this component, material and environment combination.

The staff reviewed the applicant's Fuel Oil Chemistry Program. The staff's evaluation, which is documented in SER Section 3.0.3.2.9, found that this program provides for periodic sampling of fuel oil and periodic, draining, cleaning and visual inspection of fuel tanks to maintain contaminants at acceptable limits. The staff noted that the Fuel Oil Chemistry Program is focused on periodic sampling and testing of stored fuel oil and testing of new fuel oil, and on periodic testing and examination of the fuel oil storage tanks. However, because the fuel oil storage tanks are the most likely source for contamination of the fuel oil, and fuel oil typically is not recirculated to the tanks, the staff finds it is reasonable to expect that maintaining fuel oil purity in the storage tanks is expected to result in purity of fuel oil going to individual components, such as piping/fittings and valve bodies that are part of the diesel generator fuel system. Furthermore, the staff does not expect cracking due to SCC/IGA to occur in copper alloy piping/ fittings or in brass and bronze valve bodies exposed fuel oil.

The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation, which is documented in SER Section 3.0.3.1.18, determined that the One-Time Inspection Program is consistent with the One-Time Inspection AMP XI.M32, as described in the GALL Report. The staff determined that the One-Time Inspection Program uses established NDE techniques such as enhanced visual or volumetric examination to detect cracking and is adequate to detect the presence or note the absence of cracking due to SCC/IGA for components within its scope. The staff noted that the "program description" for GALL AMR.XI.M32 states that a one-time inspection program is appropriate to verify effectiveness of a mitigative AMP (e.g., the Fuel Oil Chemistry Program) and to confirm that the aging effect is not occurring or is occurring very slowly so as not to affect the component or structure intended function during the period of extended operation.

Because 1) the staff does not expect cracking due to SCC/IGA to occur in copper alloy piping/fittings or brass and bronze valve bodies exposed to fuel oil; 2) the applicant is crediting a mitigation program that is expected to maintain purity of fuel oil going to individual components; and 3) the applicant is confirming effectiveness of its mitigation program with an inspection program that is appropriate; the staff finds the applicant's proposed AMPs for managing the aging effect for cracking due to SCC/IGA for piping/fittings made of copper alloy and for valve bodies made of brass or bronze exposed to fuel oil in the diesel generator system to be acceptable.

In LRA Table 3.3.2-8, the applicant proposed to manage loss of material-selective leaching in copper alloy heat exchanger components, heat exchanger tubes, heaters, piping, and fittings; brass valve bodies; and bronze valve bodies in an internal environment of hydraulic oil, fuel oil, and lubricating oil by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for this line item indicating that the aging effect is not in the GALL Report for these components, material, and environment combinations. The applicant also referenced a plant-specific note, which stated that for this line item loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant's Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that the GALL Report Table IX.C identifies that copper alloys with greater than 15 percent alloying zinc content, aluminum bronzes with greater than 8 percent aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15 percent alloying zinc contents may be susceptible to selective leaching, and (2) basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Program is an acceptable basis for managing loss of material in copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

LRA Table 3.3.2-8 summarizes the results of AMRs for the Diesel Generator and Support System flexible connections constructed from natural rubber exposed to fuel oil (interior) and lubricating oil (internal). The applicant proposed no aging effect and therefore stated that no AMP is required.

The applicant has indicated that generic Note G is applicable for these items with Plant-Specific Note 313. Generic Note G is “Environment not in NUREG-1801 for this component and material.” Plant-Specific Note 313 states, “[m]aterials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this environment is not in the GALL Report for this component and material. The staff does not agree 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 natural rubber is not resistant to lubricating oil and fuel oil. (P.A. Schweitzer, “Corrosion Resistance Tables – Metals, Nonmetals, Coatings, Mortars, Plastics, Elastomers and Linings, and Fabrics,” Fourth Edition, Part B, Marcel Dekker, Copyright 1995.) By letter dated March 31, 2009, RAI 3.3.2-8-1 was sent to the applicant asking the applicant to justify the use of natural rubber in fuel oil and lubricating oil with no aging effects and no need for an aging management program. In a letter dated April 6, 2009, the applicant provided its response to RAI 3.3.2-8-1. The applicant stated that certain rubber hoses were identified as being made of natural rubber when the actual materials could not be readily identified. The applicant agreed that natural rubber is not resistant to fuel oil or lubrication oil. The applicant stated that, in general, rubber flexible connections in the diesel generators and support system are constructed using nitrile rubber or are lined with Teflon, both of which have outstanding resistance to oils. The applicant stated that based on vendor recommendations, the rubber flexible hoses in the diesel generators and support system will be periodically replaced and, therefore, are not subject to aging management review. The applicant has added a new License Renewal Commitment Number 41 which reads as follows:

“Preventive maintenance requirements will be implemented to require periodic replacement of rubber flexible hoses in the Diesel Generators and Support System that are exposed to fuel oil or lubricating oil internal environments.”

The applicant stated that conforming changes are made to the LRA as follows:

“In LRA Table 3.3.2-8, Auxiliary Systems – Diesel Generators and Support System – Summary of Aging Management Evaluation, on Page 3.3-156, the line items for Flex Connections / Natural Rubber / Fuel Oil (Int) and Lubricating Oil (Int), are deleted.”

Based on the information provided by the applicant, the staff agrees that these rubber hoses are not in-scope for license renewal because they are replaced on a periodic basis and are exempted from license renewal review as stated in 10 CFR Part 54.21(a)(1)(ii).

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.9 Fire Protection System - Summary of Aging Management Review – LRA Table 3.3.2-9

The staff reviewed LRA Table 3.3.2-9, which summarizes the results of AMR evaluations for the component cooling system component groups.

In LRA Table 3.3.2-9, the applicant proposed to manage heat transfer degradation due to fouling for heat exchanger tubes fabricated from copper alloy exposed to an external uncontrolled plant outdoor air environment. The applicant credits PINGP AMP B2.1.14, “External Surfaces Monitoring Program,” for aging management. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The applicable heat exchangers are located within the fire protection system with the external side of the tubes exposed to an external uncontrolled plant indoor air environment.

The staff’s review of the applicant’s External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage heat transfer degradation due to fouling for copper alloy heat exchanger tubes exposed to external uncontrolled plant indoor air environment addressed by this AMR because a visual inspection will be capable of detecting any fouling (buildup from whatever source) on the external surface of the copper alloy heat exchanger tube. On the basis of periodic visual inspections being performed during system walkdowns at a specified frequency of these components by the PINGP AMP B2.1.14, “External Surfaces Monitoring,” for heat transfer degradation due to fouling, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of material due to crevice and pitting corrosion for spray nozzles fabricated from copper alloy exposed to an external non-sheltered outdoor air environment. The applicant credits PINGP AMP B2.1.14 “External Surfaces Monitoring Program,” for aging management. The AMR line items cite 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 review of the applicant’s External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage loss of material due to crevice and pitting corrosion for copper alloy spray nozzles exposed to external non-sheltered outdoor air environment addressed by this AMR because a visual inspection will be capable of detecting any surface deterioration and degradation on the external surface of the copper alloy spray nozzles. On the basis of periodic visual inspections being performed during system walkdowns at a specified frequency of these components by the PINGP AMP B2.1.14, “External Surfaces Monitoring,” for loss of material due to crevice and pitting corrosion, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-9, the applicant proposed to manage change in material properties due to thermal exposure and cracking due to thermal exposure for flex connections fabricated from rubber exposed to an internal treated water environment. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The applicant credits PINGP AMP B2.1.14 "External Surfaces Monitoring Program," for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, "External Surfaces Monitoring," to include non-metallic components, including rubber, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant's proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant's response acceptable as documented in the staff's evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

During its review, the staff notes that the applicant utilized a plant-specific note, which indicates that this program is credited to manage aging of internal surfaces because the external surfaces are subject to the same environment or stressor as the internal surfaces. The staff notes that the applicant's use of this program is consistent with the recommendations in the GALL Report. However, the staff determined that additional information was needed pertaining to the internal and external environments of these rubber components. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.3.2-08-01 requesting the applicant to clarify the external environment of these components, and to consider the program's ability to manage aging in non-metallic components. By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-08-01 by stating that the external environment is plant-indoor air – uncontrolled and is not identical to the internal environment of treated water. The applicant further stated the external thermal stressor (i.e. temperature), that can cause cracking and change in material properties for non-metallic components, is the same as the internal environment. The staff notes that the applicant's statement is reasonable because these rubber flex connections are not insulated; therefore, the external surface of these components will be representative of the temperature of the internal treated water environment. The staff further notes that the external surface may be subject to ultraviolet and ozone exposure which can contribute to the aging effects of cracking and change in material properties in non-metallic components. Furthermore, the staff notes this additional exposure may potentially create a more aggressive environment on the external surface when compared to the internal environment. On the basis of its review, the staff finds the applicant's response acceptable because the external environment is potentially more aggressive than the internal environment; therefore, the applicant's program, which performs inspections on the external surface of these components, will be representative of the conditions on the external surface.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-9, the applicant proposed to manage cracking due to SCC/IGA for piping/ fittings made of copper alloy exposed to a fuel oil environment using combinations of the Fire Protection Program, the Fuel Oil Chemistry Program, and the One-Time Inspection Program. For these AMR results the applicant cited generic Note H, indicating that the aging effect is not in the GALL Report for this component, material and environment combination.

Because the applicant indicated use of three different AMPs to manage the aging effect, it was not clear whether all three AMPs are being credited for each piping/fitting component, or whether for some piping/fitting components the Fuel Oil Chemistry Program in combination with the Fire Protection Program is credited, and for other piping/fitting components the Fuel Oil Chemistry Program in combination with the One-Time Inspection Program is credited. In a letter dated December 18, 2008, staff issued RAI 3.3.2-9-01 asking the applicant to clarify what combinations of AMPs are credited to manage the aging effect in the subject components.

The applicant responded to the RAI in a letter dated January 20, 2009. In that letter the applicant stated that for all copper alloy piping/fittings addressed in these AMR line items, the aging effect of cracking due to SCC/IGA is managed by a combination of all three AMPs, the Fire Protection Program, the Fuel Oil Chemistry Program, and the One-Time Inspection Program. The applicant further stated that the Fire Protection Program does not provide for mitigation of the aging effect but is credited with providing detection of the aging effect; however, the applicant further stated that the diesel-driven fire pump is under observation during performance tests and aging related degradation such as leakage will be observed, documented and evaluated.

The staff finds the applicant RAI response acceptable because it clarifies that all three AMPs are credited to manage cracking due to SCC/IGA for piping/fittings made of copper alloy exposed to a fuel oil in the fire protection system. The staff noted the applicant’s statement that the diesel-driven fire pump is under observation during performance tests such as flow and discharge tests, and sequential starting capability tests, and any age-related degradation that results in leakages will be documented and evaluated. The staff finds this response consistent with GALL AMP XI.M26 recommendations that the pump be periodically performance tested to ensure that the fuel supply line can perform its intended function.

The staff reviewed the Fire Protection Program and noted that this program stated that the diesel-driven fire pump inspection activities require that the pump be periodically performance tested. The staff issued RAI B2.1.15-1 by letter dated November 5, 2008, requesting the applicant to confirm how the periodic performance test will manage the aging effect of cracking in the fuel oil lines. In its letter dated December 5, 2008, in response to RAI B2.1.15-1, the applicant stated that in addition to the pump performance test, the internal surface of the diesel-driven fire pump fuel oil supply line is managed for cracking by the Fuel Oil Chemistry Program and the One-Time Inspection Program. The staff's evaluation of the Fire Protection Program and the RAI response is documented in SER Section 3.0.3.2.6.

The staff reviewed the applicant's Fuel Oil Chemistry Program. The staff's evaluation, which is documented in SER Section 3.0.3.2.9, found that this program provides for periodic sampling of fuel oil and periodic, draining, cleaning and visual inspection of fuel tanks to maintain contaminants at acceptable limits. The staff noted that the Fuel Oil Chemistry Program is focused on periodic sampling and testing of stored fuel oil and testing of new fuel oil, and on periodic testing and examination of the fuel oil storage tanks. However, because the fuel oil storage tanks are the most likely source for contamination of the fuel oil, and fuel oil typically is not recirculated to the tanks, the staff finds it is reasonable to expect that maintaining fuel oil purity in the storage tanks is expected to result in purity of fuel oil going to individual components, such as piping/fittings and valve bodies that are part of the diesel generator fuel system. Furthermore, the staff does not expect cracking due to SCC/IGA to occur in copper alloy piping/ fittings exposed fuel oil.

The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation, which is documented in SER Section 3.0.3.1.18, determined that the One-Time Inspection Program is consistent with the One-Time Inspection AMP XI.M32, as described in the GALL Report. The staff determined that the One-Time Inspection Program uses established NDE techniques such as enhanced visual or volumetric examination to detect cracking and is adequate to detect the presence or note the absence of cracking due to SCC/IGA for components within its scope. The staff noted that the "program description" for GALL AMR.XI.M32 states that a one-time inspection program is appropriate to verify effectiveness of a mitigative AMP (e.g., the Fuel Oil Chemistry Program) and to confirm that the aging effect is not occurring or is occurring very slowly so as not to affect the component or structure intended function during the period of extended operation.

Because 1) the staff does not expect cracking due to SCC/IGA to occur in copper alloy piping/fittings or brass and bronze valve bodies exposed to fuel oil; 2) the applicant is crediting a mitigation program that is expected to maintain purity of fuel oil going to individual components; 3) the applicant is confirming effectiveness of its mitigation program with a one-time inspection program that is appropriate; and 4) the applicant is crediting diesel fire pump testing in the Fire Protection Program with providing additional confirmation that age-related degradation is not occurring, the staff finds the applicant's proposed AMPs for managing the aging effect for cracking due to SCC/IGA for piping/ fittings made of copper alloy and for valve bodies made of brass or bronze exposed to a fuel oil in the fire protection system to be acceptable.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of material due to crevice, galvanic, general, pitting corrosion and MIC for carbon steel bolting and fasteners exposed to a buried environment using the Bolting Integrity Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material. The AMR line item also cites Plant-Specific Note 306, which indicates that components that are buried in the ground are analyzed in the same manner as raw water (damp soil containing groundwater).

The LRA credits the PINGP AMP B2.1.6 “Bolting Integrity Program,” to manage this aging effect. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that manages the loss of material for buried bolts and fasteners through the implementation of the Buried Piping and Tanks Inspection Program. This program is documented in PINGP LRA AMP B2.1.8, “Buried Piping and Tanks Inspection Program.” The staff’s evaluation of the Buried Piping and Tanks Inspection Program is documented in SER Section 3.0.3.1.7. The staff reviewed the Buried Piping and Tanks Inspection Program to verify that loss of material for buried carbon steel bolts and fasteners will be managed in accordance with the recommendations specified by the Bolting Integrity Program. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, which is implemented by the Buried Piping and Tanks Inspection Program, they will be adequately managed.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of preload due to thermal gasket creep, and loosening for carbon steel bolting and fasteners exposed to a buried environment using the Bolting Integrity Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material. The AMR line item also cites Plant-Specific Note 306, which indicates that components that are buried in the ground are analyzed in the same manner as raw water (damp soil containing groundwater).

The LRA credits the PINGP AMP B2.1.6 “Bolting Integrity Program,” to manage this aging effect. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that will manage the loss of preload for buried bolts and fasteners through the implementation of the Buried Piping and Tanks Inspection Program. This program is documented in PINGP LRA AMP B2.1.8, “Buried Piping and Tanks Inspection Program.” The staff’s evaluation of the Buried Piping and Tanks Inspection Program is documented in SER Section 3.0.3.1.7. The staff reviewed the Buried Piping and Tanks Inspection Program to verify that loss of preload for buried carbon steel bolts and fasteners will be managed in accordance with the recommendations specified by the Bolting Integrity Program. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, which is implemented by the Buried Piping and Tanks Inspection Program, they will be adequately managed.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of preload due to thermal, gasket creep, and loosening for carbon steel bolts and fasteners externally exposed to an outdoor air-sheltered environment using the Bolting Integrity Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material. The AMR line item also cites Plant-Specific Note 304, which indicates that SCC is not an applicable aging effect/mechanism since there are no bolts with a minimum yield strength > 150 ksi (> 150,000 psi).

The LRA credits the PINGP AMP B2.1.6, “Bolting Integrity Program,” to manage this aging effect. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that will manage the loss of preload due to thermal effects, gasket creep, and self loosening. As described in EPRI NP-5067, the loss of preload aging effect is most common in high temperature environments. However, thermal cycling as may be experienced in outdoor environments during the change from summer to winter months can also contribute to a loss of preload. The applicant clearly states in LRA section AMP B2.1.6, “Bolting Integrity Program,” that loss of preload (leaking or loose bolts/nuts) for closure and structural bolting is inspected periodically. These periodic inspections monitor for indications of the loss of preload. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, they will be adequately managed.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of material –selective leaching in copper alloy piping and fittings exposed to internal environment of fuel oil and spray nozzles exposed to outdoor air-not sheltered external environment by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for these line items indicating that the aging effect is not in the GALL Report for this components, material, and environment combination. The applicant also referenced a plant-specific note which stated that for these line items loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil internal environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant’s Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that the GALL Report Table IX.C states that copper alloys with greater than 15 percent alloying zinc content, aluminum bronzes with greater than 8 percent aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15 percent alloying zinc contents may be susceptible to selective leaching, and (2) basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Program is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

LRA Table 3.3.2-9, summarizes the results of AMRs for the Fire Protection System flexible connections made natural rubber exposed to halon gas (internal). The applicant proposes that for these combinations of components, materials and environment conditions, there is no AERM and therefore that no AMR is required.

The applicant has indicated that Generic Note G is applicable for these items with Plant-Specific Note 313. Generic Note G is “Environment not in NUREG-1801 for this component and material.” Plant-Specific Note 313 states, “Materials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this environment is not in 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. DuPont, the manufacturer of halon, has conducted tests on natural rubber exposed to halon and demonstrated that there is no aging effect.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.10 Fuel Oil System - Summary of Aging Management Review – LRA Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of AMR evaluations for the fuel oil system component groups.

In LRA Table 3.3.2-10, the applicant proposed to manage cracking due to SCC/IGA for piping/ fittings made of copper alloy and for valve bodies made of brass, bronze or copper alloy exposed to a fuel oil environment using the Fuel Oil Chemistry Program and the One-Time Inspection Program. For these AMR results the applicant cited generic Note H, indicating that the aging effect is not in the GALL Report for this component, material and environment combination.

The staff reviewed the applicant’s Fuel Oil Chemistry Program. The staff’s evaluation, which is documented in SER Section 3.0.3.2.9, found that this program provides for periodic sampling of fuel oil and periodic, draining, cleaning and visual inspection of fuel tanks to maintain contaminants at acceptable limits. The staff noted that the Fuel Oil Chemistry Program is focused on periodic sampling and testing of stored fuel oil and testing of new fuel oil, and on periodic testing and examination of the fuel oil storage tanks. However, because the fuel oil storage tanks are the most likely source for contamination of the fuel oil, and fuel oil typically is not recirculated to the tanks, the staff finds it is reasonable to expect that maintaining fuel oil purity in the storage tanks is expected to result in purity of fuel oil going to individual components, such as piping/fittings and valve bodies that are part of the diesel generator fuel system. Furthermore, the staff does not expect cracking due to SCC/IGA to occur in copper alloy piping/ fittings or in copper alloy, brass and bronze valve bodies exposed to fuel oil.

The staff reviewed the applicant’s One-Time Inspection Program. The staff’s evaluation, which is documented in SER Section 3.0.3.1.18, determined that the One-Time Inspection Program is consistent with the One-Time Inspection AMP XI.M32, as described in the GALL Report. The staff determined that the One-Time Inspection Program uses established NDE techniques such as enhanced visual or volumetric examination to detect cracking and is adequate to detect the presence or note the absence of cracking due to SCC/IGA for components within its scope. The staff noted that the “program description” for GALL AMR.XI.M32 states that a one-time inspection program is appropriate to verify effectiveness of a mitigative AMP (e.g., the Fuel Oil Chemistry Program) and to confirm that the aging effect is not occurring or is occurring very slowly so as not to affect the component or structure intended function during the period of extended operation.

Because 1) the staff does not expect cracking due to SCC/IGA to occur in copper alloy piping/fittings or brass and bronze valve bodies exposed to fuel oil, 2) the applicant is crediting a mitigation program that is expected to maintain purity of fuel oil going to individual components, and 3) the applicant is confirming effectiveness of its mitigation program with an inspection program that is appropriate, the staff finds the applicant’s proposed AMPs for managing the aging effect for cracking due to SCC/IGA for piping/ fittings made of copper alloy and for valve bodies made of brass or bronze exposed to a fuel oil in the fuel oil system to be acceptable.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material–selective leaching in cast iron filters, strainer housings, and pump casings; copper alloy valve bodies, piping and fittings; brass valve bodies and bronze valve bodies exposed to an internal environment of fuel oil by using the Selective Leaching of Materials Program. The applicant referenced General Note H for these line items indicating that the aging effect is not in the GALL Report for this components, material, and environment combination. The applicant also referenced a plant-specific note, which stated that for these line items loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil internal environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant’s Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that the GALL Report Table IX.C identifies that copper alloys with greater than 15 percent alloying zinc content, aluminum bronzes with greater than 8 percent aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15 percent alloying zinc contents may be susceptible to selective leaching, and (2) basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Program is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

LRA Table 3.3.2-10 summarizes the results of an AMR for the Fuel Oil System flame arrestors constructed from aluminum and exposed to outdoor air - not sheltered. The applicant claims that for this combination of component, material, and environment there is no AERM and therefore states that no AMR is required.

The staff noted that the applicant has indicated that generic Note G is applicable for these items with Plant-Specific Note 313. Nuclear Energy Institute (NEI) Standard Note G states "Environment not in NUREG-1801 for this component and material." Plant-Specific Note 313 states, "[m]aterials science evaluation for this material in this environment results in no aging effects." The staff noted that aluminum has an excellent resistance to corrosion when exposed to a humid air (outdoor environment) because aluminum oxide film is bonded strongly to its surface and, if damaged, reforms immediately in most environments. In addition, the oxide film is only 5 to 10 nanometers thick but is highly effective in protecting (i.e. passivating) the aluminum from corrosion.

The staff confirmed that this environment is not in the GALL Report for these components and materials. The staff also agrees that there is no aging effect for aluminum exposed to outdoor air. Aluminum alloys develop a passive film that quickly reforms if disturbed. (W. H. Ailor, *Atmospheric Corrosion,* McGraw-Hill, New York, 1986.)

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 Heating System - Summary of Aging Management Review – LRA Table 3.3.2-11

The staff reviewed LRA Table 3.3.2-11, which summarizes the results of AMR evaluations for the heating system component groups.

In LRA Table 3.3.2-11, the applicant proposed to manage cumulative fatigue damage due to fatigue for stainless steel piping and fittings exposed to an internal steam environment. The applicant stated this is TLAA and must be evaluated in accordance with 10 CFR 54.21(c)(1). The AMR line items cite 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 verified that in LRA Section 4.3.2 the applicant provided its TLAA evaluation for this component. The staff's evaluation of this TLAA, Non-Class 1 Fatigue, is documented in SER Section 4.3.2.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.12 Miscellaneous Gas System - Summary of Aging Management Review – LRA Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of AMR evaluations for the miscellaneous gas 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 Plant Sample System - Summary of Aging Management Review – LRA Table 3.3.2-13

The staff reviewed LRA Table 3.3.2-13, which summarizes the results of AMR evaluations for the plant sample system component groups.

In LRA Table 3.3.2-13, the applicant proposed to manage cracking due to SCC for heat exchanger components, piping/fittings, pump casings, tanks, and valve bodies made of carbon steel exposed to a treated water environment using the Closed-Cycle Cooling Water System Program. For these AMR results the applicant cited 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 cracking due to SCC is not normally associated with carbon steel components and also that the Closed-Cycle Cooling Water System Program does not include examination techniques capable of detecting cracking in carbon steel components. In a letter dated December 18, 2008, staff issued RAI 3.3.2-13-01 asking the applicant to provide a basis for expecting that cracking due to SCC may occur in carbon steel components in the plant sample system. The staff also asked the applicant to provide an examination technique for detection of cracking in these carbon steel components, or to explain why such an examination is not needed.

The applicant responded to the RAI in a letter Dated January 20, 2009. In the response the applicant stated that to control anaerobic bacteria in the cold lab sample chiller, which is a part of the plant sample system, the cold lab sample chiller was drained, flushed and refilled with an approximately 50/50 mix of fleet-charge antifreeze which also contains a nitrite-based corrosion inhibitor. The applicant stated that EPRI 1010639, Non-Class 1 Mechanical Implementation Guidelines and Mechanical Tools, Revision 4, January 2006, describes one reported case suspected to be nitrite-induced SCC of carbon steel in a treated water system with a nitrite based corrosion inhibitor. The applicant stated that their cold lab sample chiller has environmental conditions similar to those described in the EPRI document where SCC of carbon steel may have occurred. The applicant stated that because of the OE described in the EPRI document, cracking due to SCC was conservatively assumed to occur in the plant sample system hot and cold lab sample chiller components made of carbon steel.

The applicant stated that the Closed-Cycle Cooling Water System Program is both a preventive and condition monitoring program based on EPRI's "Closed Cooling Water Chemistry Guideline." The applicant stated that the program includes preventive measures to minimize corrosion, heat transfer degradation, and SCC. The applicant stated that the program performs inspections to identify corrosion, fouling and SCC that may be present. The applicant further stated that inspections for SCC will be performed by visual examination with a magnified resolution (i.e., enhanced visual) as described in 10 CFR 50.55a(b)(2)(xxi)(A) or with ultrasonic methods. As part of its RAI response, the applicant revised an enhancement to the "monitoring and trending" program element of the Closed-Cycle Cooling Water System Program to state explicitly that enhanced visual or volumetric examination techniques will be used to detect cracking.

The staff's evaluation of the applicant's change to Closed-Cycle Cooling Water System Program's enhancement is documented in SER Section 3.0.3.2.2. The staff found the revised enhancement to be acceptable as documented in SER Section 3.0.3.2.2.

The staff reviewed the applicant's Closed-Cycle Cooling Water System Program. The staff's evaluation, which is documented in SER Section 3.0.3.2.2, determined that the Closed-Cycle Cooling Water System Program is consistent with the Closed-Cycle Cooling Water System AMP XI.M21, as described in the GALL Report, with acceptable exceptions and enhancement. Based both on its review of the Closed-Cycle Cooling Water System Program and on the applicant's response to RAI AMR-3.3.2-13-01, the staff finds that the Closed-Cycle Cooling Water System Program, when enhanced, uses NDE techniques such as enhanced visual or volumetric examination to detect cracking and is adequate to detect the presence or note the absence of cracking due to SCC for components within its scope.

The staff finds that the applicant's amended aging management basis, as amended in the applicant's response to RAI 3.3.2-13-01 is acceptable because: (1) applicant has conservatively assumed that SCC may occur in these carbon steel components under exposure to treated water; (2) GALL AMP XI.M21, "Closed-Cooling Water System," indicates that these programs are appropriate to use for heat exchanger and piping components that are exposed to treated water in closed-cycle cooling water systems; and (3) the applicant has enhanced the Closed-Cycle Cooling Water System Program to include both preventive measures to decrease the likelihood of SCC and examination techniques capable of detecting the presence of SSC. Thus based on this determination, the staff finds the applicant's use of the Closed-Cycle Cooling Water System Program to manage the aging effect of cracking due to SCC in carbon steel components exposed to treated water in the plant sample system 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(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 Primary Containment Ventilation System - Summary of Aging Management Review – LRA Table 3.3.2-14

The staff reviewed LRA Table 3.3.2-14, which summarizes the results of AMR evaluations for the primary containment ventilation system component groups.

By letter dated April 13, 2009, the applicant submitted its annual update to the LRA. The applicant stated that heat exchanger tubes in certain ventilation air coolers are normally in service and may potentially be exposed to condensation. The applicant further stated that this should have been evaluated for an external environment of wet air/gas (external), but were incorrectly evaluated as plant indoor air – uncontrolled (external) or primary containment air (external). The staff noted that exposure to condensation may result in aging related degradation that was not initially accounted when these components were evaluated in a plant indoor air - uncontrolled or primary containment air environment. In LRA Table 3.3.2-14, the applicant proposed to manage heat transfer degradation due to fouling for heat exchanger tubes fabricated from copper alloy (copper-nickel) exposed to a wet air/gas (external) environment. The applicant credits PINGP AMP B2.1.14, "External Surfaces Monitoring Program," for aging management. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination. The applicable heat exchangers are located within the Primary Containment Ventilation System with the external side of the tubes exposed to a wet air/gas (external) environment.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that the External Surfaces Monitoring Program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that these periodic visual inspections are adequate to manage heat transfer degradation due to fouling for carbon steel and copper alloy (copper-nickel) heat exchanger tubes exposed to wet air/gas (external) environment addressed by this AMR because a visual inspection will be capable of detecting any fouling (buildup from whatever source) on the external surface of the carbon steel and copper alloy (copper-nickel) heat exchanger tube. On the basis of periodic visual inspections being performed during system walkdowns at a specified frequency of these components by the PINGP AMP B2.1.14, "External Surfaces Monitoring," for heat transfer degradation due to fouling, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-14, the applicant proposed to manage loss of material-selective leaching in copper nickel heat exchanger tubes in a wet air/gas external environment by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for this line item indicating that the aging effect is not in the GALL Report for these components, material, and environment combinations.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.16. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant's Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that Table IX.C in the GALL Report Volume 2 identifies that copper alloys with greater than 15 percent alloying zinc content, aluminum bronzes with greater than 8 percent aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15 percent alloying zinc contents may be susceptible to selective leaching, and (2) basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Programs is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.15 Radiation Monitoring System - Summary of Aging Management Review – LRA Table 3.3.2-15

The staff reviewed LRA Table 3.3.2-15, which summarizes the results of AMR evaluations for the radiation 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 Spent Fuel Pool Cooling System - Summary of Aging Management Review – LRA Table 3.3.2-16

The staff reviewed LRA Table 3.3.2-16, which summarizes the results of AMR evaluations for the spent fuel pool cooling 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 Station and Instrument Air System - Summary of Aging Management Review – LRA Table 3.3.2-17

The staff reviewed LRA Table 3.3.2-17, which summarizes the results of AMR evaluations for the station and instrument air system component groups.

In LRA Table 3.3.2-17, the applicant proposed to manage change in material properties due to ozone and ultraviolet exposure and cracking due to ozone and ultraviolet exposure for flex connections fabricated from PVC exposed to an external uncontrolled plant indoor air environment. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment.

The applicant credits PINGP AMP B2.1.14, “External Surfaces Monitoring Program,” for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, “External Surfaces Monitoring,” to include non-metallic components, including PVC, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant’s proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant to provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant's response acceptable as documented in the staff's evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-17, the applicant proposed to manage loss of preload- thermal, gasket creep, loosening for copper alloy bolting and fasteners externally exposed to uncontrolled plant indoor air and primary containment air environments using the Bolting Integrity Program. 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 AMR line item also cites Plant-Specific Note 304, which indicates that SCC is not an applicable aging effect/mechanism since there are no bolts with a minimum yield strength > 150 ksi (> 150,000 psi).

The LRA credits the PINGP AMP B2.1.6, "Bolting Integrity Program," to manage this aging effect. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that will manage the loss of preload through periodic inspection and preventive measures. The staff reviewed the Bolting Integrity Program to verify that loss of preload due to thermal effects, gasket creep, and self loosening will be managed in accordance with the recommendations specified by the Bolting Integrity Program. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, they will be adequately managed.

LRA Table 3.3.2-17 summarizes the results of AMRs for the station and instrument air system flexible connectors constructed from PVC exposed to dry, filtered air (internal). The applicant proposes that this component, material, environment combination have no AERM and therefore no AMP is required.

The applicant has indicated that generic Note F is applicable for these items with Plant-Specific Note 313. Generic Note F is "Material not in NUREG-1801 for this component." Plant-Specific Note 313 states, "[m]aterials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this material is not in GALL for this component. 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 PVC has no aging effect when in contact with raw water (Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956.)

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 Steam Exclusion System - Summary of Aging Management Review – LRA Table 3.3.2-18

The staff reviewed LRA Table 3.3.2-18, which summarizes the results of AMR evaluations for the steam exclusion system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-18 are consistent with the GALL Report.

3.3.2.3.19 Turbine and Administration Building Ventilation System - Summary of Aging Management Review – LRA Table 3.3.2-19

The staff reviewed LRA Table 3.3.2-19, which summarizes the results of AMR evaluations for the turbine and administration building ventilation system component groups. The staff determined that all AMR evaluation results in LRA Table 3.3.2-19 are consistent with the GALL Report.

3.3.2.3.20 Waste Disposal System - Summary of Aging Management Review – LRA Table 3.3.2-20

The staff reviewed LRA Table 3.3.2-20, which summarizes the results of AMR evaluations for the waste disposal system component groups.

In LRA Table 3.3.2-20, the applicant proposed to manage change in material properties due to ozone and ultraviolet exposure and cracking due to ozone and ultraviolet exposure for tanks fabricated from PVC exposed to an external uncontrolled plant indoor air environment. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment.

The applicant credits PINGP AMP B2.1.14, "External Surfaces Monitoring Program," for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, "External Surfaces Monitoring," to include non-metallic components, including PVC, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant's proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant's response acceptable as documented in the staff's evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-20, the applicant proposed to manage loss of material due to general, pitting, crevice, galvanic and MIC for carbon steel and stainless steel material for tanks exposed to an internal raw water environment using the Internal Inspection of Miscellaneous Piping and Ducting Components Program. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The LRA credits the PINGP AMP B2.1.22, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," to manage this aging effect of tanks in a raw water (internal) environment only. The staff's review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Sections 3.0.3.1.13. The staff finds that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program performs periodic visual inspections of internal surfaces during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections to detect aging effects that could result in a loss of the component's intended function. The staff finds that these visual inspections will be capable of detecting loss of material because evidence of material wastage will be visible on the internal surface of these components during the inspections. On the basis of its review, the staff finds that because these components will be inspected periodically by visual inspections when exposed to an internal raw water environment they will be adequately managed by this program.

LRA Table 3.3.2-20 summarizes the results of AMRs for the waste disposal system flex connectors constructed using natural rubber exposed to raw water (internal). 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 with Plant-Specific Note 313. Generic Note G is "Environment not in NUREG-1801 for this component and material." Plant-Specific Note 313 states, "[m]aterials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this environment is not in the GALL Report 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. Natural rubber is unaffected by raw water after exposure. (Phillip A. Schweitzer, PE, "Encyclopedia of Corrosion Technology," Second Edition, Revised and Expanded, CRC Press, March 17, 2004.)

LRA Table 3.3.2-20 summarizes the results of AMRs for the waste disposal system tanks constructed using PVC exposed to raw water (internal). The applicant proposed no aging effect and therefore states that no AMP is required.

The applicant has indicated that Generic Note F is applicable for these items with Plant-Specific Note 313. Generic Note F is "Material not in NUREG-1801 for this component." Plant-Specific Note 313 states, "[m]aterials science evaluation for this material in this environment results in no aging effects. The staff confirmed that this material is not in the GALL Report for this component. 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 PVC is has no aging effect when in contact with raw water (Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956.)

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 Water Treatment System - Summary of Aging Management Review – LRA Table 3.3.2-21

The staff reviewed LRA Table 3.3.2-21, which summarizes the results of AMR evaluations for the water treatment system component groups.

In LRA Table 3.3.2-21, the applicant proposed to manage change in material properties due to ozone and ultraviolet exposure and cracking due to ozone and ultraviolet exposure for demineralizers, piping, fittings, pump casings, thermowells and valve bodies fabricated from

PVC and tanks fabricated from fiberglass exposed to an external uncontrolled plant indoor air environment. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment.

The applicant credits PINGP AMP B2.1.14, “External Surfaces Monitoring Program,” for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, “External Surfaces Monitoring,” to include non-metallic components, including PVC and fiberglass, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant’s proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant’s response acceptable as documented in the staff’s evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff’s review of the applicant’s External Surfaces Monitoring Program and its evaluation are documented in SER Sections 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, by evidence of surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation, when appropriate, being performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.3.2-21, the applicant proposed to manage loss of material due to general, pitting, crevice, galvanic and MIC for carbon steel tanks exposed to an internal raw water environment using the Internal Inspection of Miscellaneous Piping and Ducting Components Program. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The LRA credits the PINGP AMP B2.1.22, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” to manage this aging effect tanks in a raw water (internal) environment only. The staff’s review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in

SER Sections 3.0.3.1.13. The staff finds that the of Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program performs periodic visual inspections of internal surfaces during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections to detect aging effects that could result in a loss of the component's intended function. The staff finds that these visual inspections will be capable of detecting loss of material because evidence of material wastage will be visible on the internal surface of these components during the inspections. On the basis of its review, the staff finds that because these components will be inspected periodically by visual inspections when exposed to an internal raw water environment they will be adequately managed by this program.

LRA Table 3.3.2-21 summarizes the results of AMRs for the water treatment system demineralizers, piping/fittings, pump casings, thermowells, and valve bodies constructed from PVC exposed to raw water (internal). The applicant proposed no aging effect and therefore states that no AMP is required.

The applicant has indicated that generic Note F is applicable for these items with Plant-Specific Note 313. Generic Note F is “Material not in NUREG-1801 for this component.” Plant-Specific Note 313 states, “[m]aterials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this material is not in the GALL Report for this component. 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 PVC has no aging effect when in contact with raw water (Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956.)

LRA Table 3.3.2-21 summarizes the results of AMRs for the water treatment system constructed from fiberglass exposed to raw water (internal). The applicant proposed no aging effect and therefore states that no AMP is required.

The applicant has indicated that generic Note F is applicable for these items with Plant-Specific Note 313. Generic Note F is “Material not in NUREG-1801 for this component.” Plant-Specific Note 313 states, “[m]aterials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this material is not in the GALL Report for this component. The staff also agrees that there will not be any aging mechanism for this material/environment combination and that no AMP is required. Common uses of fiberglass include fiberglass swimming pools and boat hulls. Fiberglass is chosen for these applications because it does not have an aging effect when in contact with water. (Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956.)

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4 Aging Management of Steam and Power Conversion System

This section of the SER documents the staff's review of the applicant's AMR results for the steam and power conversion systems components and component groups of:

- auxiliary feedwater system
- bleed steam system
- circulating water system
- condensate system
- feedwater system
- main steam system
- steam generator blowdown system
- turbine generator and support 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 Evaluations in Chapter VIII of NUREG-1801 for Steam and Power Conversion System," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the steam and power conversion 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 CRs 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 a review of the AMR items that the applicant had identified as being consistent with the GALL Report to verify 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.

The staff also conducted a review of 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 OE 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 (See SER Section 3.4.2.2.1)
Steel piping, piping components, and piping elements exposed to steam (3.4.1-2)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.4.2.2.2.1)
Steel heat exchanger components exposed to treated water (3.4.1-3)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.4.2.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to treated water (3.4.1-4)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	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. (See SER Section 3.4.2.2.9.)
Steel and stainless steel tanks exposed to treated water (3.4.1-6)	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.4.2.2.7.1)
Steel piping, piping components, and piping elements exposed to lubricating oil (3.4.1-7)	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report. (See SER Section 3.4.2.2.2.2)
Steel piping, piping components, and piping elements exposed to raw water (3.4.1-8)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Plant-specific	Yes	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with GALL Report (See SER Section 3.4.2.2.3**)**
Stainless steel and copper alloy heat exchanger tubes exposed to treated water (3.4.1-9)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.4.2.2.4.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.4.1-10)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (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 micro biologically-influ enced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	 Buried Piping and Tanks Inspection Program (B2.1.8)	Consistent with GALL Report (See SER Section 3.4.2.2.5.1)
Steel heat exchanger components exposed to lubricating oil (3.4.1-12)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.4.2.2.5.2)
Stainless steel piping, piping components, piping elements exposed to steam (3.4.1-13)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.4.2.1.1)
Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water > 60°C (> 140°F) (3.4.1-14)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (See SER Section 3.4.2.2.6)

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
Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water (3.4.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29), or Closed-Cycle Cooling Water Program (B2.1.9) or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with 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	Water Chemistry Program (B2.1.40) and One-Time Inspection Program (B2.1.29)	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	Not applicable	Not applicable to PINGP (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	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (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 micro biologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis Program (B2.1.24) and One-Time Inspection Program (B2.1.29)	Consistent with GALL Report (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	Aboveground Steel Tanks Program (B2.1.2)	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	Not applicable	Not applicable to PINGP (See SER Section 3.4.2.1.1)
Steel bolting and closure bolting exposed to air with steam or water leakage, air - outdoor (external), or air - indoor uncontrolled (external); (3.4.1-22)	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B2.1.6)	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	Not applicable	Not applicable (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 (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	Closed-Cycle Cooling Water System Program (B2.1.9)	Consistent with GALL Report
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 (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 (See SER Section 3.4.2.1.1)
Steel external surfaces exposed to air – indoor uncontrolled (external), condensation (external), or air outdoor (external) (3.4.1-28)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring Program (B2.1.14) or Above Ground Steel Tank Program (B2.1.2)	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 (B2.1.17)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal) (3.4.1-30)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	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 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	Open-Cycle Cooling Water System Program (B2.1.31)	Consistent with GALL Report
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22) or Open-Cycle Cooling Water System Program (B2.1.31)	Consistent with GALL Report (See SER Section 3.4.2.1.3)
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	Open-Cycle Cooling Water System Program (B2.1.31) Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22)	Consistent with GALL Report (See SER Section 3.4.2.1.4)
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 (See SER Section 3.4.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy > 15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water, or treated water (3.4.1-35)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching of Materials Program (B2.1.36)	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	Selective Leaching of Materials Program (B2.1.36)	Consistent with GALL Report
Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam (3.4.1-37)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Program (B2.1.40)	Consistent with GALL Report
Steel bolting and external surfaces exposed to air with borated water leakage (3.4.1-38)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion (B2.1.7)	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-39)	Cracking due to stress corrosion cracking	Water Chemistry	No	Water Chemistry (B2.1.40)	Consistent with GALL Report
Glass piping elements exposed to air, lubricating oil, raw water, and treated water (3.4.1-40)	None	None	NA	None	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.4.1-41)	None	None	NA	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.4.1-42)	None	None	NA	None	Not Used (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	NA	None	Not applicable to PINGP (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	NA	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:

- Aboveground Steel Tanks Program
- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Lubricating Oil Analysis Program
- One-Time Inspection Program
- Open-Cycle Cooling Water System Program
- Selective Leaching of Materials Program
- Water Chemistry Program

LRA Tables 3.4.2-1 through 3.4.2-8 summarize AMRs for the steam and power conversion systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant’s AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff 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 steam and power conversion system components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.4.1, 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 determined were in need of additional clarification and assessment. The staff’s evaluations of these AMRs are provided in the subsections that follows.

3.4.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.4.1, item 13, the applicant states that the corresponding AMR items in the GALL Report are not applicable to PINPG because the AMR items in the GALL Report are only applicable to particular components in BWR reactor designs and because PINGP is a Westinghouse-designed PWR facility. The staff verified that the stated AMR items in the GALL Report are only applicable to BWR designed facilities and are not applicable to the PINGP LRA.

In LRA Table 3.4.1, items 21, 23, 24, 26, 27, 34, and 42, the applicant states that the corresponding AMR result lines in the GALL Report are not applicable because PINGP does not have the component, material, and environment combination in the Steam and Power Conversion System. The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that PINGP does not have the component, material, and environment combination 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 are not applicable to PINGP.

In LRA Table 3.4.1, item 43, the applicant states that further evaluation in LRA Section 3.5.2.2.1.4 concluded that steel components in concrete are not susceptible to aging and do not require aging management. The staff noted this item applies to GALL line items VIII.I-14.and VIII.I-11, which indicates that there is no aging effect for this component type and environment, and therefore do not require an AMP. Therefore, the staff agrees with the applicant in that this line item does not require aging management.

3.4.2.1.2 Loss of Material due to General Corrosion

In LRA Table 3.4.1, item 3.4.1-28, addresses loss of material due to general corrosion for carbon steel external surfaces exposed externally to air – indoor uncontrolled, condensation, or air outdoor in the condensate system.

In LRA Tables, 3.4.2-1, 3.4.2-2, 3.4.2-3, 3.4.2-4, 3.4.2-5, 3.4.2-6, 3.4.2-7, and 3.4.2-8, the applicant credits either AMP B2.1.14, External Surfaces Monitoring Program to manage loss of material due to general corrosion in the external carbon steel surfaces of steam and power conversion system piping, piping components, piping elements,(including pump casings, valve bodies, traps, and flow restrictors, filter/strainer housings, eductors, flow restrictors, manifold, and demineralizers), tanks, and heat exchanger components that are exposed to an uncontrolled environment or alternatively, AMP B2.1.2 “Aboveground Steel Tanks Program,” to manage loss of material due to general corrosion in the carbon steel condensate storage tank surfaces that are exposed externally to an uncontrolled indoor air environment. These AMR result line items cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff noted that AMR item 28 in Table 4 of the GALL Report, Volume 1, and GALL AMR item VIII.H-7 both recommend that GALL AMP XI.M36, "External Surfaces Monitoring" be credited to manage loss of material in the external steel tank surfaces that are exposed to an uncontrolled indoor air environment. The staff noted that for all the stated carbon steel components managed in accordance with LRA AMR item 3.4.1-28, the applicant credited the External Surfaces Monitoring Program to manage loss of material in the external carbon steel surfaces that are exposed to an uncontrolled indoor air environment. The staff finds this to be acceptable because it is consistent with the AMP that is recommended for aging management of these components in GALL AMR item VII.H-7.

The staff noted and verified that the only tanks at PINGP which correspond to recommended position in GALL AMR item VIII.H-7 and for which the applicant had credited the Aboveground Steel Tanks Program for aging management are slurry tanks, which are fabricated from carbon steel materials. Upon further review by the applicant, the applicant determined that the pre-coat slurry tanks do not fulfill a 10 CFR 54.4(a)(1), (a)(2), or (a)(3) scoping function. Therefore, in a letter dated December 5, 2008 the applicant amended its LRA to remove the pre-coated slurry tanks and any AMR items associated with these tanks from the scope of the LRA. The applicant stated that these tanks (pre-coat slurry tanks) were removed from the scope of license renewal because these tanks are normally dry and are only used during refueling outages. The staff notes that the pre-coat slurry tanks do not meet the criteria in 10 CFR 54.4(a)(1), (2) or (3); therefore, these tanks are not within the scope of license renewal and therefore do not need to be addressed in the AMR items for the LRA, including those that are referenced to AMR item 28 in Table 4 of the GALL Report, Volume 1 or to AMR item VIII.H-7 in the GALL Report, Volume 2.

On the basis of its review, the staff concludes that these pre-coat slurry tanks do not meet the criteria of 10 CFR 54.4(a)(1), (2) or (3); therefore, these tanks are not within the scope of license renewal.

3.4.2.1.3 Loss of Material Due to Pitting, Crevice, and Microbiologically Influenced Corrosion

In LRA Table 3.4.1, item 3.4.1-32 addresses loss of material due to pitting, crevice, and MIC for stainless steel and copper alloy components with internal surfaces exposed to raw water in the circulating water system and turbine generator and support system.

The LRA credits the PINGP AMP B2.1.22, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” to manage this aging effect for stainless steel heat exchanger tubes and components in a raw water (internal and external) environment only. The GALL Report recommends for item 3.4.1-32 that GALL AMP XI.M20, "Open-Cycle Cooling Water System," to manage this aging effect. These AMR line items cite Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff noted that the component type recommended by GALL item VIII.A-4 is piping, piping components and piping elements. However, the applicant included copper alloy (copper-nickel) heat exchanger tubes when referencing item 3.4.1-32. The staff further noted that the applicant referenced item 3.4.1-32 of LRA Table 3.4.1 because there was not another applicable line item in LRA Table 3.4.1, for the steam and power conversion systems, which corresponded to the same component, material, environment and aging effect combination. The staff’s evaluation of heat exchanger tubes that referenced item 3.4.1-32 is evaluated separately, below.

The staff verified that only piping, fittings, pump casings and valve body components align to GALL item VIII.E-18 and VIII.E-27 and are fabricated from copper alloy and stainless steel materials that are applicable to PINGP. The staff noted that those AMR Line items that referenced GALL item VIII.A-4, VIII.E-18 and VIII.E-27 in circulating water system and turbine generator and support system are not in the scope of an open-cycle cooling water system as described in GL 89-13 and not associated with the ultimate heat sink, and, therefore, are not within the scope of GALL AMP XI.M20. The staff noted that the applicant referenced GALL item VII.C1-3 because the material, environment and aging effect requiring management corresponded.

The staff finds that the applicant’s inclusion of heat exchanger tube components referencing GALL item VIII.A-4 to be reasonable because the material, environment and aging effect requiring management correspond. However, the staff noted during its review that the applicant credits a visual inspection to detect the aging effect of loss of material in heat exchanger components and tubes. The staff determined that additional information was needed. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.3.2-20-02 requesting the applicant to justify how a visual inspection is capable of detecting loss of material in these components in those regions that are not directly visible (e.g. the bend of a heat exchanger tube). By letter dated January 20, 2009, the applicant responded by stating the AMR result line items in LRA

Table 3.4.2-8 that are heat exchanger tubes in a raw water (internal) environment which reference LRA Table 3.4.1, item 3.4.1-32, are supplied by the cooling water system. The applicant further stated these AMR result line items should have credited the Open-Cycle Cooling Water Program because eddy current testing is performed on these heat exchanger components to detect loss of material by this program. The applicant amended its LRA such that these AMR result line items now credit the Open-Cycle Cooling Water Program and reference LRA Table 3.3.1, item 3.3.1-82 and GALL item VII.C1-3. The staff determined that based on the applicant's amendment to credit the Open-Cycle Cooling Water Program for these AMR result line items, the LRA is consistent with the recommendations of the GALL Report. On the basis of its review, the staff finds that this portion of RAI 3.3.2-20-02 is acceptable because the applicant is now crediting the Open-Cycle Cooling Water Program for aging management of these heat exchanger tubes in a raw water (internal) environment that is associated with the ultimate heat sink, which is consistent with the GALL Report recommendations in GALL item VII.C1-3.

The staff's review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Section 3.0.3.1.13. The staff determined that this program, which includes periodic visual inspections during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections, is adequate to manage loss of material for stainless steel heat exchanger tubes and components exposed to raw water (external and internal) addressed by this AMR. The staff further noted that these activities are consistent with those recommended by GALL AMP XI.M20. The staff also determined that the periodic visual inspections will be capable of detecting deterioration or degradation on the material surface that would be an indication of loss of material.

On the basis of periodic visual inspections, the staff finds the applicant's use of this program acceptable. 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).

3.4.2.1.4 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion and Fouling

In LRA Table 3.4.1, item 3.4.1-33, addresses loss of material due to pitting, crevice, and MIC and fouling for stainless steel components with its external and internal surfaces exposed to raw water in the waste disposal system. The staff noted that the applicant referenced item 3.4.1-33 in LRA Table 3.3.2-20 because there was not another applicable line item in LRA Table 3.3.1 for the auxiliary systems, which corresponded to the same component, material, environment and aging effect combination.

The LRA credits the PINGP AMP B2.1.22 "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" to manage this aging effect for stainless steel heat exchanger tubes and components in a raw water (internal and external) environment only. The GALL Report recommends for item 3.4.1-33 that GALL AMP XI.M20, "Open-Cycle Cooling Water System" manage this aging effect. These AMR line items cite Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited. The staff verified that only piping, piping components and piping elements align to GALL item VIII.E-3 and are fabricated from stainless steel materials that are applicable to PINGP. The staff noted that those AMR Line items in Waste Disposal System and Water Treatment System are not in the scope of an open-cycle cooling water system as described in GL 89-13 and not associated with the ultimate heat sink, and, therefore, are not within the scope of GALL AMP XI.M20.

The staff noted during its review that several of the heat exchanger components are exposed to an external environment of raw water. However, the applicant credits a program that will perform visual inspections of the internal surfaces for aging management. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.3.2-20-01 requesting the applicant to clarify why a program that performs visual inspections of internal surfaces has been credited for aging management of component surfaces that are exposed to an external raw water environment. By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-20-01 by stating that these components that credit this program in a raw water environment are heat exchanger tubes and tubesheets. The applicant further stated that the internal and external environments are assigned based on the side of the heat exchanger tubes and tubesheets that is exposed to the environment. The applicant clarified that these components (tubes and tubesheets) are physically internal to the heat exchanger and that is why this program is credited for aging management. The applicant also stated that the internal environment of these components (tubes and tubesheets) are also internal to the heat exchanger and are evaluated in separate AMR result line items. The staff verified that for the same component, material, environment and aging effect combination, the applicant has evaluated the internal and external environments. On the basis of its review, the staff finds the applicant’s response acceptable because the applicant clarified that these components (tubes and tubesheets) are internal to the heat exchanger and the internal and external environments of these components are evaluated separately.

The staff also noted during its review that the applicant credits a visual inspection to detect the aging effect of loss of material in heat exchanger components and tubes. However, the staff determined that additional information was needed, so by letter dated December 18, 2008, the staff issued RAI 3.3.2-20-02 requesting the applicant to justify how a visual inspection is capable of detecting loss of material in these components in those regions that are not directly visible (ex. the bend of a heat exchanger tube). By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-20-02 by stating that this program is credited for aging management of heat exchanger components that include tubes, shells, tubesheets and channelheads. The applicant further stated the activities that will be performed as part of this program to detect degradation of these stainless steel components include periodic visual inspections during surveillance and maintenance activities. The staff noted that the applicant will choose the inspection locations based on conditions that are susceptible to the aging effects of concern. The staff further noted that the applicant’s inspection will monitor parameters such as rust, discoloration, scale/deposits, pitting and surface discontinuities which are indications that loss of material and degradation are occurring. Based on the applicant’s response to RAI 3.3.2-20-02, the staff noted the applicant evaluated the internal and external environments of these heat exchanger tubes and components separately because these components are physically internal to the heat exchanger. The staff confirmed in LRA Table 3.3.2-20 that the applicant evaluated the external side and internal side of the heat exchanger tubes and components, separately. Furthermore, the staff noted that the applicant is crediting a visual inspection on the external side of these heat exchanger tubes and components only since a visual inspection will be capable of identifying indications of loss of material on all areas of the heat exchanger tubes, including the bends of the components. The staff confirmed that for the internal side of these heat exchanger tubes and components the applicant has credited the GALL Report recommended program for aging management. On the basis of its review, the staff finds the applicant's response acceptable because (1) the inspection of these components at locations that have conditions that are susceptible to the aging effect of loss of material and (2) a visual inspection of these components will be capable of identifying evidence that may be indicative of degradation and loss of material.

The staff's review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Section 3.0.3.1.13. The staff determined that this program, which includes periodic visual inspections and volumetric testing, when appropriate, during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections, is adequate to manage loss of material for stainless steel heat exchanger tubes and components exposed to raw water (external and internal) addressed by this AMR. The staff further noted that these activities are consistent with those recommended by GALL AMP XI.M20. The staff also determined that the periodic visual inspections will be capable of detecting deterioration or degradation on the material surface that would be an indication of loss of material.

On the basis of periodic visual inspections, the staff finds the applicant's use of this program acceptable. 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 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 MIC, and fouling
- reduction of heat transfer due to fouling
- loss of material due to general, pitting, crevice, and MIC cracking due to SCC
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and MIC
- loss of material due to general, pitting, crevice, and galvanic corrosion
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the 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

(1) LRA Section 3.4.2.2.2.1 addresses the applicant's aging management basis for managing loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, piping elements exposed to treated water or steam and in steel heat exchanger components exposed to treated water. The applicant stated that the aging effect of loss of material due to general, pitting and crevice corrosion in these components will be managed by a combination of the Water Chemistry and the One-Time Inspection programs. The applicant also included loss of material due to galvanic corrosion as an aging effect in the affected components managed by the Water Chemistry and One-Time Inspection programs.

The staff reviewed LRA Section 3.4.2.2.2.1 against the criteria in SRP-LR Section 3.4.2.2.2.1, which 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 SRP-LR states that the existing AMP relies on monitoring and control of water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations 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. 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.

SRP-LR Section 3.4.2.2.2.1 invokes AMR items 2, 3, and 4 in Table 4 of the GALL Report, Volume 1 and GALL AMR items VIII.A-16, VIII.B1-11, VIII.C-4, VIII.C-7, VIII.D1-8, VIII.E-34, VIII.F-25 and VIII.G-38, applicable for steel piping, piping components and piping elements exposed to treated water or steam in the auxiliary systems; and GALL item VIII.E-37 and VIII.F-28, applicable for steel heat exchanger components in the auxiliary systems. For all of these GALL AMR items, the recommended AMPs are Water Chemistry (GALL AMP XI.M.32) and One-Time Inspection (GALL AMP XI.M32).

The staff noted that piping, piping components, pump casings, turbine casings, demineralizers, and heat exchanger components in the bleed steam system, condensate system, circulating water system, heating system, main steam system, turbine generator and support system, auxiliary feedwater system, chemical and volume control system, control room and miscellaneous area ventilation system, plant sample system, steam generator blowdown system, steam generator system, and water treatment system are included in the AMR results referring to LRA Section 3.4.2.2.2.1.

The staff also noted that the applicant had identified loss of material due to galvanic corrosion as a potential aging effect for piping, piping components, pump casings, and heat exchanger components made of carbon steel, cast iron, ductile iron, and chrome-molybdenum alloy exposed to treated water or steam in the systems listed above. For these components, the applicant had included a plant-specific note stating that loss of material due to galvanic corrosion is included as a potential aging effect/mechanism. The applicant also proposed to manage this aging effect/mechanism using the Water Chemistry Program and the One-Time Inspection Program.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program provides mitigation for loss of material due to corrosion in components in a treated water environment. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, determined that the applicant's One-Time Inspection Program is consistent with the One-Time Inspection AMP XI.M32, as described in the GALL Report, and is adequate to detect the presence or note the absence of loss of material due to general, pitting, crevice and galvanic corrosion for components within its scope. The staff confirmed 1) that the applicant is crediting the AMPs recommended in GALL AMR items VIII.A-16, VIII.B1-11, VIII.C-4, VIII.C-7, VIII.D1-8, VIII.E-37, VIII.F-25 and VIII.G-38; 2) that the Water Chemistry Program provides mitigation for the identified age-related degradation, and 3) that the One-Time Inspection Program provides verification of the effectiveness of the Water Chemistry Program to mitigate loss of material due to general, pitting or crevice corrosion in steel piping, piping components, pump casings, and heat exchanger exposed to treated water. The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.4.2.2.2.1 and in GALL AMR items VIII.A-16, VIII.B1-11, VIII.C-4, VIII.C-7, VIII.D1-8, VIII.E-37, VIII.F-25 and VIII.G-38.

Based on the programs identified, 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 3.4.2.2.2.1, 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).

(2) The applicant stated in LRA Section 3.4.2.2.2.2 that loss of material due to general, pitting and crevice corrosion could occur for steel piping, piping components, and piping elements exposed to lubricating oil. LRA Section 3.4.2.2.2.2 further states that 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and

the One-Time Inspection Program; 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results; 3) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation; 4) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions and 5) components containing hydraulic fluid and not lubricating oil are also managed by the Lubricating Oil Analysis Program and the One-Time Inspection Program.

The staff reviewed LRA Section 3.4.2.2.2.2 against the criteria in SRP-LR Section 3.4.2.2.2.2, which states that loss of material due to general, pitting and crevice corrosion could occur for steel piping, piping components, and piping elements exposed to lubricating oil. SRP-LR Section 3.4.2.2.2.2 further states that: 1) the existing AMP relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion; 2) the GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program; and 3) a one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring.

SRP-LR Section 3.4.2.2.2.2 invokes AMR item 7 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VIII.G-35 (Auxiliary Feedwater System) as applicable to loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to lubricating oil. These components are identified in LRA Table 3.2.1-02: Filter / Strainer Housings, Piping / Fittings, Pump Casings, Valve Bodies, LRA 3.4.2-1: Filter / Strainer Housings, Piping / Fittings, Pump Casings, Valve Bodies, Tanks.

The staff reviewed LRA Appendix B, Sections B2.1.23, “Lubricating Oil Analysis,” and B2.1.18, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively, and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material and 2) will perform one-time inspections of select steel components in the most susceptible locations exposed to lubricating oil for loss of material due to general, pitting and crevice corrosion at susceptible locations to verify the effectiveness of the applicant’s Lubricating Oil Analysis Program in applicable steam and power systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item VIII.G-35 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.4.2.2.2.2.

For those line items that apply to LRA Section 3.4.2.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

LRA Section 3.4.2.2.3 addresses loss of material due to general, pitting, crevice, microbiologically-influenced corrosion and fouling in steel piping, piping components and piping elements exposed to raw water. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage this aging effect in steel internal surfaces exposed to internal raw water.

The staff reviewed LRA Section 3.4.2.2.3 against the criteria in SRP-LR Section 3.4.2.2.3, which states that loss of material due to pitting general, pitting, crevice, MIC and fouling in steel piping, piping components and piping elements exposed to raw water can occur and recommends further evaluation of a plant-specific AMP to ensure this aging effect is adequately managed.

The GALL Report, under item VIII.G-36, recommends that a plant-specific program be credited to manage loss of material due to pitting and crevice corrosion for steel piping, piping components, and piping elements in the Steam and Power Conversion Systems.

The staff verified that the only piping, fittings, valve bodies and heat exchanger components aligning to GALL AMR VIII.G-36 for the Steam and Power Conversion System- Circulating Water System and Turbine Generator and Support System are fabricated from steel materials.

The staff noted during its review that the applicant credits a visual inspection to detect the aging effect of loss of material in heat exchanger components and tubes. However, the staff determined that additional information was needed. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.3.2-20-02 requesting the applicant to justify how a visual inspection is capable of detecting loss of material in these components in those regions that are not directly visible (e.g. the bend of a heat exchanger tube). By letter dated January 20, 2009, the applicant responded by stating the AMR result line items in LRA Table 3.4.2-8 that are heat exchanger components in a raw water (internal) environment which reference LRA Table 3.4.1, item 3.4.1-08, are supplied by the cooling water system. The applicant further stated these AMR result line items should have credited the Open-Cycle Cooling Water Program because eddy current testing is performed on these heat exchanger components to detect loss of material by this program. The applicant amended its LRA such that these AMR result line items now credit the Open-Cycle Cooling Water Program and reference LRA Table 3.4.1, item 3.4.1-32 and GALL item VIII.E-6. The staff determined that based on the applicant's amendment to credit the Open-Cycle Cooling Water Program for these AMR result line items, the LRA is consistent with the recommendations of the GALL Report. On the basis of its review, the staff finds that that applicant's aging management basis, as amended in its response to RAI 3.3.2-20-02 is acceptable because the applicant is now crediting the Open-Cycle Cooling Water Program for aging management of these heat exchanger components in a raw water (internal) environment, which is consistent with the GALL Report recommendations in GALL item VIII.E-6.

The staff reviewed the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Sections 3.0.3.1.13.

The staff notes that the applicant credits this program with managing the aging effect of loss of material due to galvanic corrosion. The staff verified that the applicant has credited this program with the applicable aging effects addressed in SRP-LR Section 3.4.2.2.3 and the applicant is conservatively managing loss of material due to galvanic corrosion in an internal raw water environment with this program. This program performs visual inspections of internal surfaces of components during periodic system and component surveillance activities or during maintenance activities when the internal surface becomes accessible for visual inspections to detect aging effects that could result in a loss of the component's intended function. The staff finds that these visual inspections will be capable of detecting loss of material because evidence of material wastage will be visible on the internal surface of these components during the inspections.

Based on the programs identified, the staff concludes that the applicant's program meets SRP-LR Section 3.4.2.2.3 criteria. For those line items that apply to LRA Section 3.4.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.4 Reduction of Heat Transfer Due to Fouling

(1) LRA Section 3.4.2.2.4.1 addresses the applicant's aging management basis for managing reduction of heat transfer due to fouling in stainless steel and copper alloy heat exchanger tubes exposed to treated water. In the LRA, the applicant stated that the aging effect of reduction of heat transfer due to fouling in these components will be managed by a combination of the Water Chemistry Program and the One-Time Inspection Program.

    The staff reviewed LRA Section 3.4.2.2.4.1 against the criteria of SRP-LR Section 3.4.2.2.4.1, which states that reduction of heat transfer due to fouling may occur for stainless steel and copper alloy heat exchanger tubes exposed to treated water. The SRP-LR states that the existing AMP relies on control of water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may not always have been adequate to preclude fouling. Therefore, the GALL Report recommends that the effectiveness of the water chemistry control program be verified to ensure that reduction of heat transfer due to fouling is not occurring. The SRP-LR states that a one-time inspection is an acceptable method to ensure that reduction of heat transfer is not occurring and that the component's intended function will be maintained during the period of extended operation.

    SRP-LR Section 3.4.2.2.4.1 invokes AMR item 9 in Table 4 of the GALL Report, Volume 1, and GALL AMR items VIII.E-13 and VIII.G-10 for stainless steel heat exchanger tubes exposed to treated water in the condensate system and for copper alloy heat exchanger tubes exposed to treated water in the auxiliary feedwater system. The staff noted that the applicant's AMR results are for stainless steel and copper alloy heat exchanger tubes exposed to treated water in the auxiliary feedwater system.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, found that the Water Chemistry Program provides mitigation for reduction of heat transfer due to fouling in heat exchanger components exposed to treated water. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, found that the One-Time Inspection Program is adequate to detect the presence or note the absence of fouling which might cause reduction of heat transfer in heat exchanger tubes. The staff confirmed 1) that the applicant is crediting the AMPs recommended in GALL AMR items VIII.E-13 and VIII.G-10; 2) that the Water Chemistry Program implements chemistry related activities for the mitigation corrosion-induced age-related degradation; and 3) that the One-Time Inspection Program provides verification of the effectiveness of the Water Chemistry Program to mitigate reduction of heat transfer due to fouling in stainless steel and copper alloy heat exchanger tubes exposed to treated water. The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.4.2.2.4.1 and in GALL AMR items VIII.E-13 and VIII.G-10.

Based on the programs identified, the staff concludes that the applicant's proposed programs are acceptable for managing the aging effects in the applicable components. 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).

(2) The applicant stated in LRA Section 3.4.2.2.4.2 that reduction of heat transfer due to fouling could occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. LRA Section 3.4.2.2.4.2 further states that 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results to maintain oil systems contaminants (primarily water and particulates) within acceptable limits and 3) the One-Time Inspection Program performs sampling inspections that either verify unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.4.2.2.4.2 against the criteria in SRP-LR Section 3.4.2.2.4.2, which states that reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. SRP-LR Section 3.4.2.2.4.2 further states that 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program; 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results. The program maintains oil systems contaminants (primarily water and particulates), within acceptable limits, thereby preserving an environment that is not conducive to degradation; 3) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions; and 4) components containing hydraulic fluid and not lubricating oil are also managed by the Lubricating Oil Analysis Program and the One-Time Inspection Program.

SRP-LR Section 3.4.2.2.4.2 invokes AMR item 10 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VIII.G-8 (Auxiliary Feedwater System) and VIII.G-12 (Auxiliary Feedwater System) as applicable to reduction of heat transfer due to fouling of steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. These components are identified in LRA Table 3.4.2-1: Heat Exchanger Tubes, LRA Table 3.3.2-8: Heat Exchanger Tubes.

The staff reviewed LRA Appendix B, Sections B2.1.29, "Lubricating Oil Analysis" and B2.1.24, "One-Time Inspection," in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively, and found that these programs 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of heat transfer due fouling and 2) will perform one-time inspections of select steel, stainless steel and copper alloy heat exchanger tubing exposed to lubricating oil for loss of heat transfer due to fouling to verify the effectiveness of the Lubricating Oil Analysis Program in applicable steam and power conversion systems.

The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR items VIII.G-8 and VIII.8-12 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.4.2.2.4.2.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.4.2 criteria. For those line items that apply to LRA Section 3.4.2.2.4.2, 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).

3.4.2.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

(1) The applicant stated in LRA Section 3.4.2.2.5.1 that the loss of material due to general, pitting, crevice, and MIC could occur for steel piping, piping components, and piping elements buried in soil regardless of the presence of pipe coatings or wrappings and this aging effect is managed with the Buried Piping and Tanks Inspection Program. LRA Section 3.3.2.2.5.1 further states that the Buried Piping and Tanks Inspection Program includes preventive measures to mitigate degradation (e.g., coatings and wrappings required by design) and visual inspections of external surfaces of buried piping components, when excavated, for evidence of coating damage and degradation and these inspections either verify that unacceptable degradation is not occurring or trigger additional actions.

The staff reviewed LRA Section 3.4.2.2.5.1 against the criteria in SRP-LR Section 3.4.2.2.5.1, which states that loss of material due to general, pitting, crevice corrosion, and microbiologically-influenced corrosion could occur for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. SRP-LR Section 3.4.2.2.5.1 further states that 1) the buried piping and tanks inspection program relies 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 and 2) 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 is not occurring.

SRP-LR Section 3.4.2.2.5.1 invokes AMR item 11 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VIII.E-1 (Condensate System) as applicable to loss of material due to general, pitting, crevice, and MIC of steel piping, piping component, piping elements, and tanks exposed to soil. These components are identified in LRA Table 3.3.2-10: Tanks.

The staff reviewed LRA Appendix B, Sections B2.1.8, "Buried Piping and Tanks Inspection," in SER Section 3.0.3.1.7 and found that this program provides focused or opportunistic excavations and inspections for general, pitting, crevice, and microbiologically-influenced corrosion of buried steel piping and tanks within 10 years before the period of extended operation and within 10 years after the initiation of the period of extended operation. The staff finds that these activities are based on industry practice and provide for periodic excavations and visual inspections of buried piping and tanks for general, pitting and crevice corrosion and microbiologically-influenced corrosion.

The GALL AMP XI.34 program element "parameters monitored/inspected" states that the program monitors parameters such as coating and wrapping integrity that are directly related to corrosion damage of the external surface of buried steel piping and tanks. The staff noted that the applicant is crediting the Buried Piping and Tanks Inspection Program as recommended in GALL AMR item VIII.E-1 which the GALL Report states is an acceptable program to monitor possible corrosion damage to the external surface of piping and tanks. Therefore, the staff finds that, based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.4.2.2.5.1.

Based on the program identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.5.1 criteria. For those line items that apply to LRA Section 3.4.2.2.5.1, 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).

(2) The applicant stated in LRA Section 3.4.2.2.5.2 that loss of material due to general, pitting, crevice, and MIC could occur for steel heat exchanger components exposed to lubricating oil. The LRA further states that: 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program; 2) the Lubricating Oil Analysis Program includes periodic oil sampling,

analysis, and evaluation and trending of results; 3) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation; 4) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions; and 5) components containing hydraulic fluid and not lubricating oil are also managed by the Lubricating Oil Analysis Program and the One-Time Inspection Program.

The staff reviewed LRA Section 3.4.2.2.5.2 against the criteria in SRP-LR Section 3.4.2.2.5.2 which states that loss of material due to general, pitting and crevice corrosion, and MIC could occur in steel heat exchanger components exposed to lubricating oil. SRP-LR Section 3.4.2.2.5.2 further states that 1) the existing AMP relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion and 2) the effectiveness of lubricating oil contaminant control can be achieved through a one-time inspection of selected components at susceptible locations.

SRP-LR Section 3.4.2.2.5.2 invokes AMR item 12 in Table 3 of the GALL Report, Volume 1, and GALL AMR item VIII.G-6 (Auxiliary Feedwater System) as applicable to loss of material due to general, pitting, crevice, and MIC of heat exchanger components, exposed to lubricating oil. These components are identified in LRA Table 3.1.2-2: Heat Exchanger Components, LRA Table 3.4.2-5: Heat Exchanger Components, LRA Table 3.4.2-8: Heat Exchanger Components.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.18 respectively and found that these programs: 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to general, pitting, crevice, and MIC; and 2) will perform one-time inspections of select steel heat exchanger tubing exposed to lubricating oil for loss of material due to general, pitting, crevice corrosion, and MIC to verify the effectiveness of the Lubricating Oil Analysis Program in applicable steam and power conversion systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR item VIII.G-6 and the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. In addition, the staff finds the applicant's use of the Lubricating Oil Analysis Program to manage components containing hydraulic fluid conservative and therefore acceptable. Therefore, the staff finds that, based on the programs identified above, the applicant meets the criteria of SRP-LR Section 3.4.2.2.5.2.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.4.2.2.5.2 criteria. For those line items that apply to LRA Section 3.4.2.2.5.2, 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).

3.4.2.2.6 Cracking Due to Stress Corrosion Cracking

LRA Section 3.4.2.2.6 addresses the applicant's aging management basis for managing cracking due to SCC in stainless steel piping, piping components, piping elements, tanks, and heat exchangers components exposed to treated water greater than 60 °C (>140 °F). In the LRA, the applicant stated that the aging effect of cracking due to SCC in these components will be managed by a combination of the Water Chemistry program and the One-Time Inspection program.

The staff reviewed LRA Section 3.4.2.2.6 against the criteria in SRP-LR Section 3.4.2.2.6, which states that cracking due to SCC may occur in the stainless steel piping, piping components, piping elements, tanks, and heat exchangers components exposed to treated water greater than 60 °C (>140°F), and for stainless steel piping, piping components, and piping elements exposed to steam. The SRP-LR states that the existing AMP relies on monitoring and control of water chemistry to manage the effects of cracking due to SCC. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause SCC. Therefore, the GALL Report recommends that the effectiveness of the water chemistry control program be verified to ensure that SCC is not occurring and that the component's intended function would be maintained during the period of extended operation.

SRP-LR Section 3.4.2.2.6 invokes AMR item 14 in Table 4 of the GALL Report, Volume 1, and GALL AMR items VIII.B-1, VIII.C-2, VIII.D1-5, VIII.E-30, VIII.E-38, VIII.F-3, and VIII.F-24. The staff noted that for all of the GALL AMR items, the recommended AMPs are Water Chemistry (GALL AMP XI.M2) and One-Time Inspection (GALL AMP XI.M32).

The staff noted that piping and piping components, expansion joints, feedwater inlet nozzles, flex connections, heat exchanger tubes, tanks, and pump casings in the bleed steam system, the chemical and volume control system, the condensate system, the feedwater system, the heating system, the plant sample system, the radiation monitoring system, the reactor coolant system, the steam generator blowdown system, the steam generator system, and the turbine generator and support system are included in the AMR results referring to LRA Section 3.4.2.2.6.

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.19, found that the Water Chemistry Program provides mitigation for cracking due to SCC for stainless steel components in a treated water environment. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18 found that the One-Time Inspection Program is adequate to detect the presence or note the absence of cracking due to SCC for components within its scope. The staff confirmed 1) that the applicant is crediting the AMPs recommended in GALL AMR items VIII.B-1, VIII.C-2, VIII.D1-5, VIII.E-30, VIII.E-38, VIII.F-3, and VIII.F-24; 2) that the Water Chemistry Program provides mitigation for the identified age-related degradation; and 3) that the One-Time Inspection Program provides verification of the effectiveness of the Water Chemistry Program to mitigate cracking due to SCC in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60 °C (>140 °F). The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.4.2.2.6 and in GALL AMR items VIII.B-1, VIII.C-2, VIII.D1-5, VIII.E-30, VIII.E-38, VIII.F-3, and VIII.F-24.

Based on the programs identified, the staff concludes that the applicant's proposed programs are acceptable for managing the aging effects in the applicable components. 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

(1) LRA Section 3.4.2.2.7.1 addresses the applicant's aging management basis for managing loss of material due to general (steel only), pitting, and crevice corrosion in steel and stainless steel tanks; in aluminum and copper alloy piping, piping components, and piping elements; and in stainless steel piping, piping components, and piping elements, tanks and heat exchanger components exposed to treated water. The applicant stated that for steel and stainless steel tanks, for stainless steel piping, piping components, and piping elements, and for stainless steel heat exchanger components, the aging effect is managed by a combination of the Water Chemistry Program and the One-Time Inspection Program. The applicant also stated that for aluminum and copper alloy piping, piping components and piping elements, the aging effect is managed with the Water Chemistry Program and One-Time Inspection Program, with the Closed-Cycle Cooling Water System Program, or with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The applicant stated that the Closed-Cycle Cooling Water System Program includes both preventive measures (corrosion inhibitor addition and chemical testing) to minimize aging effects and component inspections to monitor for the effects of aging.

The staff compared LRA Section 3.4.2.2.7.1 against the criteria of SRP-LR Section 3.4.2.2.7.1, which states that loss of material due to pitting and crevice corrosion may occur for stainless steel, aluminum, and copper alloy piping, piping components and piping elements and for stainless steel tanks and heat exchanger components exposed to treated water. The SRP-LR states that the existing AMP relies on monitoring and control of water chemistry to manage the effects of loss of material due to pitting, and crevice corrosion. However, control of water chemistry does not preclude corrosion at locations of stagnant flow conditions. Therefore, the GALL Report recommends that the effectiveness of the water chemistry program should be verified to ensure that corrosion is not occurring. The SRP-LR states that a one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and the component's intended function will be maintained during the period of extended operation.

SRP-LR Section 3.4.2.2.7.1 invokes AMR items 6, 15 and 16 in Table 4 of the GALL Report, Volume 1, and GALL AMR items VIII.A-5, VIII.B1-4, VIII.C-1, VIII.D1-4, VIII.E-15, VIII.E-29, VIII.E-36, VIII.E-40, VIII.F-23, and VIII.G-32. The staff noted that components in the chemical and volume control system, the condensate system, the heating system, the reactor coolant system, the steam generator blowdown system, the auxiliary feedwater system, the containment spray system, the control room and miscellaneous area ventilation system, the fire protection system, the turbine generator and support system, and the water treatment system are included in the AMR results referring to LRA Section 3.4.2.2.7.1

The staff reviewed the applicant's Water Chemistry Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.18, determined that the applicant's Water Chemistry Program, provides mitigation for loss of material due to general corrosion in steel components and due to pitting and crevice corrosion in stainless steel, copper-alloy and aluminum components. The staff reviewed the applicant's One-Time Inspection Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.1.18, determined that the applicant's One-Time Inspection Program is consistent with the One-Time Inspection AMP XI.M32, as described in the GALL Report, and is adequate to detect the presence or note the absence of loss of material due to general, pitting, crevice, and galvanic corrosion for components within the scope of the program. The staff confirmed 1) that the applicant is crediting the AMPs recommended in GALL AMR items VIII.A-5, VIII.B1-4, VIII.C-1, VIII.D1-4, VIII.E-15, VIII.E-29, VIII.E-36, VIII.E-40, VIII.F-23, and VIII.G-32; 2) that the Water Chemistry Program provides mitigation for the identified age-related degradation, and 3) that the One-Time Inspection Program provides verification of the effectiveness of the Water Chemistry Program to mitigate loss of material due to general, pitting or crevice corrosion in steel and stainless steel tanks, piping, piping components, pump casings, and heat exchanger components, and in aluminum and copper alloy piping, piping components and piping elements exposed to treated water. The staff finds the applicant's AMR results acceptable because the AMPs credited with aging management are consistent with the guidance in SRP-LR Section 3.4.2.2.7.1 and in GALL AMR items VIII.A-5, VIII.B1-4, VIII.C-1, VIII.D1-4, VIII.E-15, VIII.E-29, VIII.E-36, VIII.E-40, VIII.F-23, and VIII.G-32.

The staff noted that the applicant credits the Closed-Cycle Cooling Water System Program in lieu of the Water Chemistry and One-Time Inspection programs for managing loss of material due to pitting and crevice corrosion in aluminum heat exchanger tubes exposed to treated water in the control room and miscellaneous area ventilation system and in aluminum heaters exposed to treated water in the fire protection system. The staff also noted that the applicant cited generic Note E for these AMR results, indicating that the results are consistent with the GALL Report for material, environment and aging effect, but the proposed AMP is different from the one recommended in the GALL Report.

The staff reviewed the applicant's Closed-Cycle Cooling Water System Program. The staff's evaluation of this program, which is documented in SER Section 3.0.3.2.2, determined that the Closed-Cycle Cooling System Program, with an enhancement, is consistent with the Closed-Cycle Cooling Water System AMP XI.M21, as described in the GALL Report with acceptable exceptions. The staff determined that the applicant's Closed-Cycle Cooling Water System Program includes preventive measures, such as use of corrosion inhibitors, to minimize the effects of aging due to corrosion; and it includes inspection activities to monitor for loss of material due to pitting and crevice corrosion. Based on the staff's determination that the applicant's Closed-Cycle Cooling Water System Program provides both mitigation and detection for the potential aging effect, the staff finds the applicant's proposed use of the Closed-Cycle Cooling Water System Program for managing loss of material due to pitting and crevice corrosion in aluminum heat exchanger tubes exposed to treated water in the control room and miscellaneous area ventilation system and in aluminum heaters exposed to treated water in the fire protection system to be acceptable.

The staff noted that LRA Table 3.4.2-8 includes two AMR result lines for aluminum pump casings in a raw water environment in the turbine generator and support system where the aging effect is loss of material due to crevice and pitting corrosion and the proposed AMP is the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components. For these AMR results, the applicant referenced to LRA Table 3.4.1, AMR item 3.4.1-15, and GALL AMR item VIII.E-15, and cited generic Note E. The staff noted that the environment corresponding to AMR item 3.4.1-15 and GALL AMR item VIII.E-15 is treated water, not raw water. Because of the inconsistency of environments between the applicant's AMR result line and the corresponding GALL AMR item, the staff determined that the applicant's reference to AMR item 3.4.1-15 and use of generic Note E appeared to be incorrect.

In a January 22, 2009, telephone conference, the staff requested that the two entries for aluminum pump casings in raw water in LRA Table 3.4.2-8 (page 3.4-142) be clarified to eliminate confusion over whether treated water or raw water is the applicable environment for the component. In a letter dated February 6, 2009, the applicant stated that the environment for the aluminum pump casings is raw water and that the reference to GALL AMR item VIII.E-15 and to LRA Table 3.4.1, AMR item 3.4.1-15, and the use of generic Note E are incorrect. The staff verified that in the letter of February 6, 2009, the applicant amended LRA Table 3.4.1, AMR item 3.4.1-15, to delete the reference to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program for aging management. The staff also verified that the applicant amended LRA Table 3.4.2-8 for the two AMR items related to loss of material for the aluminum pump casings that are exposed to raw water and specifically amended the AMR items to delete the reference to GALL AMR item VIII.E-15 and to LRA AMR item 3.4.1-15, and revise these AMR items note from E to generic Note G, indicating that the environment is not in the GALL Report for this material and environment combination. The two revised AMR result lines are evaluated by the staff in SER Section 3.4.2.3.8.

Based on the programs identified, 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 3.4.2.2.7.1, 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).

(2) LRA Section 3.4.2.2.7.2 addresses loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil and

states that this aging effect is not applicable because there are no stainless steel components exposed to soil in the steam and power conversion systems.

SRP-LR Section 3.4.2.2.7.2 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff reviewed the PINGP UFSAR, and verified that there are no stainless steel components exposed to soil in the steam and power conversion systems that are within the scope the license renewal and subjected to an AMR.

On this basis, the staff finds that criteria in SRP-LR Section 3.4.2.2.7.2 are not applicable to PINGP.

(3) The applicant stated in LRA Section 3.4.2.2.7.3 that loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to lubricating oil. LRA Section 3.4.2.2.7.3 further states that: 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program; 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results; 3) the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation; 4) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions; and 5) components containing hydraulic fluid and not lubricating oil are also managed by the Lubricating Oil Analysis Program and the One-Time Inspection Program.

The staff reviewed LRA Section 3.4.2.2.7.3 against the criteria in SRP-LR Section 3.4.2.2.7.3, which states that loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing AMP relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. SRP-LR Section 3.4.2.2.7.3 further states that the effectiveness of lubricating oil contaminant control can be verified through a one-time inspection of selected components at susceptible locations and one-time inspection is an acceptable method to ensure that corrosion is not occurring.

SRP-LR Section 3.4.2.2.7.3 invokes AMR item 18 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VIII.G-19 (Auxiliary Feedwater System), VIII.D1-2 (Feedwater System), VIII.A-3 (Steam Turbine System) as applicable to loss of material due to pitting and crevice corrosion of stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. These components are identified in LRA Table 3.1.2-2: Piping / Fittings, Valve Bodies, LRA Table 3.4.2-8: Piping / Fittings, Valve Bodies, LRA Table 3.4.2-5: Filter / Strainer Housings, Valve Bodies.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively, and found that these programs: 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to pitting and corrosion and 2) will perform one-time inspections of select copper alloy piping, piping components, and piping elements exposed to lubricating oil for loss of material due to pitting and crevice corrosion to verify the effectiveness of the Lubricating Oil Analysis Program in applicable Steam and Power Conversion systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR items VIII.G-19, VIII.D1-2 and, VIII.A-3, the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.4.2.2.7.3.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.7.3 criteria. For those line items that apply to LRA Section 3.4.2.2.7.3, 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).

3.4.2.2.8 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The applicant stated in LRA Section 3.4.2.2.8 that loss of material due to pitting, crevice, and MIC could occur for stainless steel piping, piping components, heat exchanger components and tanks exposed to lubricating oil. LRA Section 3.4.2.2.8 further states that: 1) this aging effect is managed with a combination of the Lubricating Oil Analysis Program and the One-Time Inspection Program; 2) the Lubricating Oil Analysis Program includes periodic oil sampling, analysis, and evaluation and trending of results; the program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to degradation; 3) the One-Time Inspection Program performs sampling inspections using NDE techniques that either verify unacceptable degradation is not occurring or trigger additional actions, and; 4) components containing hydraulic fluid and not lubricating oil are also managed by the Lubricating Oil Analysis Program and the One-Time Inspection Program.

The staff reviewed LRA Section 3.4.2.2.8 against the criteria in SRP-LR Section 3.4.2.2.8 which states that loss of material due to pitting, crevice, and MIC could occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil. SRP-LR Section 3.4.2.2.8 further states that: 1) the existing AMP relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion; and, 2) the effectiveness of lubricating oil contaminant control can be verified through a one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring.

SRP-LR Section 3.4.2.2.8 invokes AMR item 19 in Table 3 of the GALL Report, Volume 1, and GALL AMR items VIII.G-29 (Auxiliary Feedwater System), VIII.G-3 (Auxiliary Feedwater System), VIII.D1-3 (Feedwater System) and, VIII.A-9 (Steam Turbine System) as applicable to loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to lubricating oil. These components are identified in LRA Table 3.4.2-1: Filter / Strainer Elements, Restricting Orifices.

The staff reviewed LRA Appendix B, Sections B2.1.24, “Lubricating Oil Analysis” and B2.1.29, “One-Time Inspection” in SER Sections 3.0.3.1.14 and 3.0.3.1.18 respectively and found that these programs: 1) provide for periodic sampling of lubricating oil to maintain contaminants at acceptable limits to preclude loss of material due to pitting, crevice and MIC; and 2) will perform one-time inspections of select stainless steel piping, piping components, piping elements exposed to lubricating oil for loss of material due to pitting, crevice and MIC to verify the effectiveness of the Lubricating Oil Analysis Program in applicable Steam and Power Conversion systems. The GALL Report states that one-time inspection is an acceptable method to verify the effectiveness of a mitigative AMP such as the Lubricating Oil Analysis Program. The staff noted that the applicant is crediting the Lubricating Oil Analysis Program as recommended in GALL AMR items VIII.G-29, VIII.G-3, VIII.D1-3 and, VIII.A-9, the applicant is verifying effectiveness of the Lubricating Oil Analysis Program with the elements of the One-Time Inspection Program, which the GALL Report states is an acceptable program to verify the Lubricating Oil Analysis Program effectiveness. Therefore, the staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.4.2.2.8.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-LR Section 3.4.2.2.8 criteria. For those line items that apply to LRA Section 3.4.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Galvanic Corrosion

LRA Section 3.4.2.2.9 addresses the applicant’s aging management basis for managing loss of material due to general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to treated water. The applicant stated that LRA Table 3.4.1, AMR item 3.4.1-3 was used in lieu of AMR item 3.4.1-5 for evaluation of the steel heat exchanger components exposed to treated water in the condensate system; and, therefore, LRA Table 3.4.1, AMR item 3.4.1-5, was designated as “not used.”

The staff compared LRA Section 3.4.2.2.9 against the criteria of SRP-LR Section 3.4.2.2.9, which 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 SRP-LR states that the existing AMP relies on monitoring and control of water chemistry to manage the aging effect of loss of material. However, control of water chemistry does not preclude loss of material at locations with stagnant flow conditions. The GALL Report recommends a one-time inspection program of selected components and susceptible locations to ensure that corrosion is not occurring.

SRP-LR Section 3.4.2.2.9 invokes AMR item 5 in Table 4 of the GALL Report, Volume 1, and GALL AMR item VIII.E-7. In the GALL Report, Volume 1, Table 4, and in the SRP-LR, Table 3.4-1, AMR item 5 is designated as applicable for BWRs, only. The staff noted that for the GALL Report item, the recommended AMPs are Water Chemistry (GALL AMP XI.M2) and One-Time Inspection (GALL AMP XI.M32). The staff also noted that Water Chemistry and One-Time Inspection are the AMPs recommended in the GALL Report, Volume 1, Table 4, item 3, and in SRP-LR, Table 3.4-1, item 3, which refers to SRP-LR Section 3.4.2.2.2.1. The staff determined that the recommended AMPs are the same, no matter whether the steel heat exchanger components in the condensate system are included in the evaluation for LRA Table 3.4.1, AMR item 3.4.1-3 or are evaluated separately under LRA Table 3.4.1, AMR item 3.4.1-5.

Because the AMPs recommended for AMR item 3.4.1-3 and for AMR item 3.4.1-5 are identical, the staff finds it acceptable for the applicant to designate LRA Table 3.4.1, AMR item 3.4.1-5 as not used, and to use LRA Table 3.4.1, AMR item 3.4.1-3, for evaluation of steel heat exchanger components in the condensate system. The staff's evaluation of these and other components included in LRA Table 3.4.1, AMR item 3.4.1-3 are provided in SER Section 3.4.2.2.2.1.

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 3.4.2-8, 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 3.4.2-8, the applicant indicated, via notes F through J that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.4.2.3.1 Auxiliary Feedwater System - Summary of Aging Management Review – LRA Table 3.4.2-1

The staff reviewed LRA Table 3.4.2-1, which summarizes the results of AMR evaluations for the auxiliary feedwater system component groups.

In LRA Table 3.4.2-1, the applicant proposed to manage loss of material–selective leaching in cast iron pump casings, filter, and strainer housings; copper alloy heat exchanger tubes; and bronze valve bodies exposed to internal and external environments of hydraulic oil and lubricating oil, by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for these line items indicating that the aging effect is not in the GALL Report for this components, material, and environment combination. The applicant also referenced a plant-specific note, which stated that for these line items loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil internal environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant’s Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that the GALL Report Table IX.C identifies that copper alloys with greater than 15% alloying zinc content, aluminum bronzes with greater than 8% Aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15% alloying zinc contents may be susceptible to selective leaching, and (2) the basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Program is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.2 Bleed Steam System - Summary of Aging Management Review – LRA Table 3.4.2-2

The staff reviewed LRA Table 3.4.2-2, which summarizes the results of AMR evaluations for the bleed steam system component groups.

In LRA Table 3.4.2-2, the applicant proposed to manage cumulative fatigue damage due to fatigue for stainless steel piping and fittings exposed to an internal treated water and steam environment and for chrome-molybdenum alloy piping and fittings exposed to an internal steam environment. The applicant stated this is TLAA and must be evaluated in accordance with 10 CFR 54.21(c)(1). The AMR line items cite 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 verified that in LRA Section 4.3.2 the applicant provided its TLAA evaluation for this component. The staff's evaluation of this TLAA, Non-Class 1 Fatigue, is documented in SER Section 4.3.2.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.3 Circulating Water System - Summary of Aging Management Review – LRA Table 3.4.2-3

The staff reviewed LRA Table 3.4.2-3, which summarizes the results of AMR evaluations for the circulating water system component groups.

In LRA Table 3.4.2-3, the applicant proposed to manage change in material properties due to thermal exposure and cracking due to thermal exposure for expansion joints fabricated from natural rubber exposed to an internal raw water environment. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The applicant credits PINGP AMP B2.1.14 "External Surfaces Monitoring Program" for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, "External Surfaces Monitoring" to include non-metallic components, including natural rubber, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant's proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant to provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant's response acceptable as documented in the staff's evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

During its review the staff notes that the applicant utilized a plant-specific note which indicates that this program is credited to manage aging of internal surfaces because the external surfaces are subject to the same environment or stressor as the internal surfaces. The staff notes that the applicant's use of this program is consistent with the recommendations in the GALL Report. However, the staff determined that additional information was needed pertaining to the internal and external environments of these natural rubber components. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.3.2-08-01 requesting the applicant to clarify the external environment of these components, and to consider the program's ability to manage aging in non-metallic components. By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-08-01 by stating that the external environment is plant-indoor air – uncontrolled and is not identical to the internal environment of raw water. The applicant further stated the external thermal stressor (i.e., temperature) that can cause cracking and change in material properties for non-metallic components is the same as the internal thermal exposure stressor. The staff notes that the applicant's statement is reasonable because these natural rubber flex connections are not insulated and, therefore, the external surface of these components will be representative of the temperature of the internal raw water environment. The staff further notes that the external surface may be subject to ultraviolet and ozone exposure which can contribute to the aging effects of cracking and change in material properties in non-metallic components. Furthermore, the staff notes this additional exposure may create a more aggressive environment on the external surface when compared to the internal environment. On the basis of its review, the staff finds the applicant's response acceptable because the external environment is subject to the same thermal stressor and is more aggressive than the internal environment because of the additional ultraviolet and ozone exposure; therefore, the applicant's program which performs inspections on the external surface of these components will be representative of the conditions on the internal surface.

The staff reviewed the applicant's External Surfaces Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled with a physical manipulation when appropriate, and is evidenced by surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation and that these activities will be performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

In LRA Table 3.4.2-3, the applicant proposed to manage change in material properties due to cracking for PVC piping, fittings and valve bodies exposed to an external uncontrolled plant indoor air environment. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this environment.

The applicant credits PINGP AMP B2.1.14 “External Surfaces Monitoring Program” for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, “External Surfaces Monitoring” to include non-metallic components, including PVC, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant’s proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant to provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant’s response acceptable as documented in the staff’s evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

The staff reviewed the applicant’s External Surfaces Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, and is evidenced by surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008 to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation and that these activities will be performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

LRA Table 3.4.2-3 summarizes the results of AMRs for the circulating water system piping, fittings and valve bodies constructed using PVC exposed to raw water (internal). 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 F is applicable for these items with plant-specific note 413. Generic Note F is “Material not in NUREG-1801 for this component.” Plant-specific note 413 states, “Materials science evaluation for this material in this environment results in no aging effects." The staff confirmed that this material is not in the GALL Report for this component. 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 PVC is has no aging effect when in contact with raw water (Roff, W. J., *Fibres, Plastics, and Rubbers: A Handbook of Common Polymers*, Academic Press Inc., New York, 1956.)

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 circulating water system components not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.4 Condensate System - Summary of Aging Management Review – LRA Table 3.4.2-4

The staff reviewed LRA Table 3.4.2-4, which summarizes the results of AMR evaluations for the condensate system component groups.

In LRA Table 3.4.2-4, the applicant proposed to manage change in material properties due to thermal exposure and cracking due to thermal exposure for expansion joints fabricated from natural rubber exposed to an internal treated water environment. The AMR line items cite Generic Note H, which indicates that the aging effect is not addressed in the GALL Report for this component, material and environment combination.

The applicant credits PINGP AMP B2.1.14 “External Surfaces Monitoring Program” for aging management. The staff notes that the applicant has proposed to enhance the scope of program of GALL AMP XI.M36, “External Surfaces Monitoring” to include non-metallic components, including natural rubber, and the aging effects of change in material properties and cracking. The staff further notes the intent of GALL AMP XI.M36 is to perform visual inspections of steel components for loss of material. The staff determined that additional information was needed on the applicant’s proposed augmentation to PINGP AMP B2.1.14. Therefore, by letter dated November 5, 2008, the staff issued RAI B2.1.14-1 requesting the applicant provide an appropriate program that will manage the effects of aging for non-metallic components, including PVC. The applicant responded to RAI B2.1.14-1 by letter dated December 5, 2008, and the staff finds the applicant’s response acceptable as documented in the staff’s evaluation of RAI B2.1.14-1 in SER Section 3.0.3.2.5.

During its review the staff notes that the applicant utilized a plant-specific note which indicates that this program is credited to manage aging of internal surfaces because the external surfaces are subject to the same environment or stressor as the internal surfaces. The staff notes that the applicant’s use of this program is consistent with the recommendations in the GALL Report. However, the staff determined that additional information was needed pertaining to the internal and external environments of these natural rubber components. Therefore, by letter dated December 18, 2008, the staff issued RAI 3.3.2-08-01 requesting the applicant to clarify the external environment of these components, and to consider the program’s ability to manage aging in non-metallic components. By letter dated January 20, 2009, the applicant responded to RAI 3.3.2-08-01 by stating that the external environment is plant-indoor air – uncontrolled and is not identical to the internal environment of treated water. The applicant further stated the external thermal stressor (i.e. temperature) that can cause cracking and change in material properties for non-metallic components is the same as the internal environment. The staff notes that the applicant's statement is reasonable because these natural rubber flex connections are not insulated and, therefore, the external surface of these components will be representative of the temperature of the internal treated water environment. The staff further notes that the external surface may be subject to ultraviolet and ozone exposure which can contribute to the aging effects of cracking and change in material properties in non-metallic components. Furthermore, the staff notes this additional exposure may potentially create a more aggressive environment on the external surface when compared to the internal environment. On the basis of its review, the staff finds the applicant's response acceptable because the external environment is potentially more aggressive than the internal environment; therefore, the applicant's program, which performs inspections on the external surface of these components, will be representative of the conditions on the external and internal surface.

The staff reviewed the applicant's External Surfaces Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.5. The staff notes that this program will include periodic visual inspections of external surfaces performed during system walkdowns at a specified frequency. The staff further notes that age-related degradation of non-metallic components, such as change in material properties and cracking, can be detected by a visual inspection, coupled by a physical manipulation when appropriate, and is evidenced by surface discontinuities that include cracking, crazing, peeling, blistering, chalking, flaking, physical distortion, discoloration, loss of material from wear, and signs of leakage. The applicant amended its LRA, by letter dated December 5, 2008, to supplement the visual inspection with a physical manipulation when appropriate. The staff notes stated that this program will supplement the visual examination with a physical manipulation in order to verify aging effects such as hardening, embrittlement, or gross softening are not occurring. The staff notes that the physical manipulation will supplement and aid the visual inspection in detecting age-related degradation because changes in material properties, such as hardening and loss of strength, can be detected during manipulation of non-metallic components, when appropriate, 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 periodic visual inspections supplemented by a physical manipulation and that these activities will be performed during system walkdowns at a specified frequency, the staff finds the applicant's use of the External Surfaces Monitoring Program acceptable.

LRA Table 3.4.2-4 summarizes the results of AMRs for Condensate System flex connections constructed from stainless exposed to outdoor air – sheltered (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 the GALL Report 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. Stainless steel forms a passive film in outdoor air that is immediately repassivated if disturbed. Therefore, there is no aging effect for stainless steel in air and no AMP is required. There is a similar material/environment combination in the GALL Report and the aging effect is none and no AMP is required (See the GALL Report items III TP-5, IV RP-04, V EP-18, VII AP-17, and VIII SP-12).

In LRA Table 3.4.2-4, the applicant proposed to manage loss of preload due to thermal, gasket creep loosening for carbon steel and stainless steel bolts and fasteners externally exposed to an outdoor air- sheltered environment using the Bolting Integrity Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material. The AMR line item also cites Plant-Specific Note 304, which indicates that SCC is not an applicable aging effect/mechanism since there are no bolts with a minimum yield strength > 150 ksi.

The LRA credits the PINGP AMP B2.1.6 “Bolting Integrity Program” to manage this aging effect. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.1. The Bolting Integrity Program is an existing PINGP program that will manage the loss of preload due to thermal effects, gasket creep, and self loosening. As described in EPRI NP-5067, the loss of preload aging effect is most common in high temperature environments. However, thermal cycling may be experienced in outdoor environments during the change from summer to winter months, can also contribute to a loss of preload. The applicant clearly states in LRA Section AMP B2.1.6 “Bolting Integrity Program” that loss of preload (leaking or loose bolts/nuts) for closure and structural bolting is inspected periodically. These periodic inspections monitor for indications of the loss of preload. On the basis of its review, the staff finds that because these components will be inspected through the specifications of the Bolting Integrity Program, they will be adequately managed.

In LRA Table 3.4.2-4, the applicant proposed to manage cumulative fatigue damage due to fatigue for stainless steel piping and fittings exposed to an internal treated water environment. The applicant stated this is TLAA and must be evaluated in accordance with 10 CFR 54.21(c)(1). The AMR line items cite 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 verified that in LRA Section 4.3.2 the applicant provided its TLAA evaluation for this component. The staff’s evaluation of this TLAA, Non-Class 1 Fatigue, is documented in SER Section 4.3.2.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.5 Feedwater System - Summary of Aging Management Review – LRA Table 3.4.2-5

The staff reviewed LRA Table 3.4.2-5, which summarizes the results of AMR evaluations for the feedwater system component groups.

In LRA Table 3.4.2-5, the applicant proposed to manage loss of material–selective leaching in copper alloy piping and fittings, cast iron pump casings, and brass valve bodies exposed to internal environments of lubricating oil by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for these line items indicating that the aging effect is not in the GALL Report for this components, material, and environment combination. The applicant also referenced a plant-specific note, which stated that for these line items loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil internal environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant's Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that the GALL Report Table IX.C identifies that copper alloys with greater than 15 percent alloying zinc content, aluminum bronzes with greater than 8 percent aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15 percent alloying zinc contents may be susceptible to selective leaching, and (2) basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Program is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

In LRA Table 3.4.2-5, the applicant proposed to manage cumulative fatigue damage due to fatigue for stainless steel piping and fittings exposed to an internal treated water environment. The applicant stated this is TLAA and must be evaluated in accordance with 10 CFR 54.21(c)(1). The AMR line items cite 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 verified that in LRA Section 4.3.2 the applicant provided its TLAA evaluation for this component. The staff's evaluation of this TLAA, Non-Class 1 Fatigue, is documented in SER Section 4.3.2.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.6 Main Steam System - Summary of Aging Management Review – 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 cumulative fatigue damage due to fatigue for stainless steel piping and fittings exposed to an internal steam environment. The applicant stated this is TLAA and must be evaluated in accordance with 10 CFR 54.21(c)(1). The AMR line items cite 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 verified that in LRA Section 4.3.2 the applicant provided its TLAA evaluation for this component. The staff's evaluation of this TLAA, Non-Class 1 Fatigue, is documented in SER Section 4.3.2.

3.4.2.3.7 Steam Generator Blowdown System - Summary of Aging Management Review – LRA Table 3.4.2-7

The staff reviewed LRA Table 3.4.2-7, which summarizes the results of AMR evaluations for the steam generator blowdown system component groups.

In LRA Table 3.4.2-7, the applicant proposed to manage cumulative fatigue damage due to fatigue for stainless steel piping and fittings exposed to an internal treated water environment. The applicant stated this is TLAA and must be evaluated in accordance with 10 CFR 54.21(c)(1). The AMR line items cite 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 verified that in LRA Section 4.3.2 the applicant provided its TLAA evaluation for this component. The staff's evaluation of this TLAA, Non-Class 1 Fatigue, is documented in SER Section 4.3.2.

3.4.2.3.8 Turbine Generator and Support System - Summary of Aging Management Review – LRA Table 3.4.2-8

The staff reviewed LRA Table 3.4.2-8, which summarizes the results of AMR evaluations for the turbine generator and support system component groups.

In LRA Table 3.4.2-8, the applicant proposed to manage loss of material due to pitting and crevice corrosion for aluminum material for pump casings exposed to an internal raw water environment using the Internal Inspection of Miscellaneous Piping and Ducting Components Program. The AMR line items cite Generic Note G, which indicates that this environment is not addressed in the GALL Report for this component and material combination. The applicant stated that the environment for this component is evaluated as raw water and is essentially waste water or a potential mixture of water and oil.

The LRA credits the PINGP AMP B2.1.22 "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" to manage this aging effect tanks in a raw water (internal) environment only. The staff's review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and its evaluation are documented in SER Section 3.0.3.1.13. The staff finds that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program performs periodic visual inspections of internal surfaces during periodic system and component surveillance activities or during maintenance activities when the internal surface is accessible for visual inspections to detect aging effects that could result in a loss of the component's intended function. The staff finds that these visual inspections will be capable of detecting loss of material because evidence of material wastage will be visible on the internal surface of these components during the inspections. On the basis of its review, the staff finds that because these components will be inspected periodically by visual inspections when exposed to an internal raw water environment they will be adequately managed by this program.

In LRA Table 3.4.2-8, the applicant proposed to manage loss of material–selective leaching in copper nickel heat exchanger tubes exposed to wet air/gas external environment, and cast iron heat exchanger components; brass valve bodies, filters, and strainer housings; and bronze valve bodies exposed to internal environments of hydraulic and lubricating oil, by using the Selective Leaching of Materials Program. The applicant referenced Footnote H for these line items indicating that the aging effect is not in the GALL Report for this components, material, and environment combination. The applicant also referenced a plant-specific note, which stated that for these line items loss of material due to selective leaching for copper alloys and gray cast iron is evaluated in a fuel oil and lubricating oil internal environment.

In LRA B2.1.36, the applicant stated that the Selective Leaching of Materials Program will include a one-time visual inspection in conjunction with a hardness measurement, or other suitable detection technique of selected components that may be susceptible to selective leaching. The staff's evaluation of the Selective Leaching of Materials Program is documented in SER Section 3.0.3.2.15. The staff finds that this new one-time program is consistent with GALL AMP XI.M33, "Selective Leaching," and includes an approved exception related to physical examinations.

The staff noted that the one-time inspection program credited under the applicant's Selective Leaching Program is consistent with the one-time inspection basis credited in GALL AMP XI.M33, "Selective Leaching," for component materials that are identified as being susceptible to selective leaching. The staff also noted that the GALL Report Table IX.C identifies that copper alloys with greater than 15% alloying zinc content, aluminum bronzes with greater than 8% aluminum alloying contents and cast irons may be susceptible to selective leaching. On this basis, the staff finds the Selective Leaching of Materials Program is a valid program to credit for the management of loss of material due to selective leaching in these copper alloy piping and fittings because the basis is consistent with: (1) the basis in GALL Table IX.C, which identifies that copper alloys with greater than 15% alloying zinc contents may be susceptible to selective leaching, and (2) basis in GALL AMP XI.M33 that the one-time inspection proposed in Selective Leaching Program is an acceptable basis for managing loss of material in for copper alloy, aluminum bronze and cast iron components as a result of selective leaching.

In LRA Table 3.4.2-8, the applicant proposed to manage cumulative fatigue damage due to fatigue for stainless steel piping and fittings exposed to an internal treated water and internal steam environment. The applicant stated this is TLAA and must be evaluated in accordance with 10 CFR 54.21(c)(1). The AMR line items cite 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 verified that in LRA Section 4.3.2 the applicant provided its TLAA evaluation for this component. The staff's evaluation of this TLAA, Non-Class 1 Fatigue, is documented in SER Section 4.3.2.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that for those items with aging effects, the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the steam and power conversion systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5 Aging Management of Structures and Component Supports

This section of the SER documents the staff's review of the applicant's AMR results for the structures and component supports components and component groups of:

- auxiliary and turbine buildings
- component supports
- cranes, heavy loads, fuel handling
- D5/D6 diesel generator building and underground storage vault, fuel oil transfer house, old service building, and new service building
- fire protection barriers
- radwaste building, old administration building, and administration building addition
- reactor containment vessels units 1 and 2
- SBO yard structures
- shield buildings units 1 and 2
- tank foundations
- water control structures – approach canal, emergency cooling water intake, intake canal, and screenhouse

3.5.1 Summary of Technical Information in the Application

LRA Section 3.5 provides AMR results for the structures and component supports components and component groups. LRA Table 3.5.1, "Summary of Aging Management Evaluations in

Chapters II and III of NUREG-1801 for Structures and Component Supports," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the structures and component 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 CRs 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 structures and component supports components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted a review of the AMR items that the applicant had identified as being consistent with the GALL Report 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.

The staff also conducted a review of 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 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 Structures and Component Supports 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
PWR Concrete (Reinforced and Prestressed) and Steel Containments					
Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable). (3.5.1-1)	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater if environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Yes	Not applicable	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	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.1.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (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	See SER Section 3.5.2.2.1.3
Steel elements: drywell; torus; drywell head; embedded shell and sand pocket regions; drywell support skirt; torus ring girder; downcomers; liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor, suppression chamber (as applicable) (3.5.1-5)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.5.2.1.1)
Steel elements: steel liner, liner anchors, integral attachments (3.5.1-6)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes	ASME Section XI, IWE (B2.1.4) and 10 CFR Part 50, Appendix J (B2.1.1)	Consistent with GALL Report (See SER Section 3.5.2.2.1.4)

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
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 PINGP (See SER Section 3.5.2.2.1.5)
Steel and stainless steel elements: vent line, vent header, vent line bellows; downcomers; (3.5.1-8)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.5.2.1.1)
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 - Metal fatigue	Consistent with GALL Report (See SER Section 3.5.2.2.1.6)
Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds (3.5.1-10)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds.	Yes	ASME Section XI, IWE (B2.1.4) and 10 CFR Part 50, Appendix J (B2.1.1)	Consistent with GALL Report (See SER Section 3.5.2.2.1.7)
Stainless steel vent line bellows, (3.5.1-11)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examination/ evaluation for bellows assemblies and dissimilar metal welds.	Yes	Not applicable	Not applicable to PWRs (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
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	TLAA	Consistent with GALL Report (See SER Section 3.5.2.2.1.8)
Steel, stainless steel elements, dissimilar metal welds: torus; vent line; vent header; vent line bellows; downcomers (3.5.1-13)	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J, and supplemented to detect fine cracks	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.5.2.1.1)
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	See SER Section 3.5.2.2.1.9
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	See SER Section 3.5.2.2.1.10

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Seals, gaskets, and moisture barriers (3.5.1-16)	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	ASME Section XI, IWE (B2.1.4) and 10 CFR Part 50, Appendix J (B2.1.1)	Consistent with GALL Report
Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms (3.5.1-17)	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and plant Technical Specifications	No	ASME Section XI, IWE (B2.1.4), 10 CFR Part 50, Appendix J (B2.1.1), and Plant Technical Specification Program	Consistent with GALL Report
Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch (3.5.1-18)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	ASME Section XI, IWE (B2.1.4) and 10 CFR Part 50, Appendix J (B2.1.1)	Consistent with GALL Report, (See SER Section 3.5.2.1.2)
Steel elements: stainless steel suppression chamber shell (inner surface) (3.5.1-19)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable	Not applicable to PWRs
Steel elements: suppression chamber liner (interior surface) (3.5.1-20)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable	Not applicable to PWRs
Steel elements: drywell head and downcomer pipes (3.5.1-21)	Fretting or lock up due to mechanical wear	ISI (IWE)	No	Not applicable	Not applicable to PWRs

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
Prestressed containment: tendons and anchorage components (3.5.1-22)	Loss of material due to corrosion	ISI (IWL)	No	Not applicable	Not applicable to PINGP (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 (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)
All Groups except Group 6: interior and above grade exterior concrete (3.5.1-24)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)
All Groups except Group 6: steel components: all structural steel (3.5.1-25)	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the Structures Monitoring Program is to include provisions to address protective coating monitoring and maintenance	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
All Groups except Group 6: accessible and inaccessible concrete: foundation (3.5.1-26)	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557)	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1 and 3.5.2.2.2.2.1)
All Groups except Group 6: accessible and inaccessible interior/exterior concrete (3.5.1-27)	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report, (See SER Section 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 (B2.1.38)	Consistent with GALL Report (See SER Section 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	Not applicable	Not Applicable (See SER Section 3.5.2.2.2.1 and 3.5.2.2.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Group 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	10 CFR 50, Appendix J (B2.1.1) or Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)
Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation (3.5.1-31)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling), aggressive chemical attack; cracking, loss of bond, and loss of material (spalling, scaling), corrosion of embedded steel	Structures Monitoring Program; examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.2.4)
Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations (3.5.1-32)	Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide	Structures Monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (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	Plant-specific	Yes	Structures Monitoring Program (B2.1.38) & RG 1.127 , Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35)	Consistent with GALL Report (See SER Section 3.5.2.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Group 6: concrete; all (3.5.1-34)	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; cracking, loss of bond, loss of material due to corrosion of embedded steel	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Yes	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35)	Consistent with GALL Report (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	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35)	Consistent with GALL Report (See SER Section 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	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35)	Consistent with GALL Report (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	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35)	Consistent with GALL Report (See SER Section 3.5.2.2.2.4.3)
Groups 7, 8: tank liners (3.5.1-38)	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes	Water Chemistry Program (B2.1.40)	Consistent with GALL Report (See SER Section 3.5.2.2.2.5)
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-39)	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.6)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Building concrete at locations of expansion and grouted anchors; grout pads for support base plates (3.5.1-40)	Reduction in concrete anchor capacity due to local concrete degradation, service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Yes	Structures Monitoring Program (B2.1.38) ASME Section XI, Subsection IWF Program (B2.1.5)	Consistent with GALL Report (See SER Section 3.5.2.2.2.6)
Vibration isolation elements (3.5.1-41)	Reduction or loss of isolation function, radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report (See SER Section 3.5.2.2.2.6)
Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds (3.5.1-42)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA & ASME Section XI, Subsection IWF Program (B2.1.5)	Consistent with GALL Report (See SER Section 3.5.2.2.2.7)
Groups 1-3, 5, 6: all masonry block walls (3.5.1-43)	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Masonry Wall Program (B2.1.25), Fire Protection Program (B2.1.15)	Consistent with GALL Report (See SER Section 3.5.2.1.3)
Group 6: elastomer seals, gaskets, and moisture barriers (3.5.1-44)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Group 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	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35)	Consistent with GALL Report
Group 5: fuel pool liners (3.5.1-46)	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels	No	Water Chemistry Program (B2.1.40) / Structures Monitoring Program (B2.1.38)	Consistent with GALL Report, (See SER Section 3.5.2.1.4)
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	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35) / Structures Monitoring Program (B2.1.38)	Consistent with GALL Report, (See SER Section 3.5.2.1.5)
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	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (B2.1.35)	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
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-49)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	No	Not applicable	Not applicable to PWRs
Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-50)	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Not applicable	Not applicable to PINGP (See SER Section 3.5.2.1.1)
Group B1.1: high strength low-alloy bolts (3.5.1-51)	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	No	Bolting Integrity Program (B2.1.6)	Consistent with GALL Report
Groups B2, and B4: sliding support bearings and sliding support surfaces (3.5.1-52)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	No	Structures Monitoring Program (B2.1.38)	Consistent with GALL Report
Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure (3.5.1-53)	Loss of material due to general and pitting corrosion	ISI (IWF)	No	ASME Section XI, IWF Program (B2.1.5)	Consistent with GALL Report
Groups B1.1, B1.2, and B1.3: constant and variable load spring hangers; guides; stops; (3.5.1-54)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	ASME Section XI, IWF Program (B2.1.5)	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
Steel, galvanized steel, and aluminum support members; welds; bolted connections; support anchorage to building structure (3.5.1-55)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion (B2.1.7)	Consistent with GALL Report
Groups B1.1, B1.2, and B1.3: sliding surfaces (3.5.1-56)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	ASME Section XI, IWF Program (B2.1.5)	Consistent with GALL Report
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	ASME Section XI, IWF Program (B2.1.5)	Consistent with GALL Report
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	NA	None	Consistent with GALL Report
Stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-59)	None	None	NA	None	Consistent with GALL Report

The staff's review of the structures and component supports 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 structures and component supports 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 structures and component supports components:

- 10 CFR Part 50, Appendix J Program
- ASME Section XI, Subsection IWE Program
- Bolting Integrity Program
- Boric Acid Corrosion Program
- Fire Protection Program
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program
- Masonry Wall Program
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program
- Structures Monitoring Program
- Water Chemistry Program

LRA Tables 3.5.2-1 through 3.5.2-11 summarize AMRs for the structures and component supports components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which it does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP.

The staff reviewed these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff reviewed these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from the GALL Report component, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff reviewed 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 the GALL Report component, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff reviewed these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff reviewed these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff 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 structures and components support 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 3.4.1, 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 determined were in need of additional clarification and assessment. The staff's evaluations of these AMRs are provided in the subsections that follows.

3.5.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.5.1, items 5, 8, 11, 13, 19, 20, 21, and 49 the applicant states that the corresponding AMR items in GALL Report are not applicable to PINPG because the AMR items in the GALL Report are only applicable to particular components in BWR reactor designs and because PINGP is a Westinghouse-designed PWR facility. The staff verified that the stated AMR items in the GALL Report are only applicable to BWR designed facilities and are not applicable to the PINGP LRA.

LRA Table 3.5.1, items 22, and 50 are identified as "Not Applicable" since the component, material, and environment combination does not exist at PINGP. 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 PINGP. Since PINGP 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 PINGP.

3.5.2.1.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

In the discussion section of LRA Table 3.5.1, item 3.5.1-18, the applicant stated that ASME Section XI, Subsection IWE, and 10 CFR 50, Appendix J will be used to manage aging affects due to general, pitting, and crevice corrosion of reactor building (containment) penetration sleeves with dissimilar metal welds, personal airlocks, and equipment hatches. The applicant stated that the Fire Protection Program will also be used to manage the aging effect/mechanism in areas subject to loss of material due to general corrosion. The staff noted the AMR item 3.5.1-18 included a reference to Note E and plant-specific Note 8, which states that "NUREG-1801 includes the aging effect loss of material due to general, pitting, and crevice corrosion. Loss of material due to pitting and crevice corrosions is not applicable at PINGP since air indoor and air outdoor environments do not contain aggressive contaminants and are not continuously wetted."

The staff reviewed the AMR results lines that referenced Note E and plant-specific Note 8. The staff determined, for these line items, 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.S1, "ASME Section XI, Subsection IWE and AMP XI.S4.] "10 CFR Part 50, Appendix J," the applicant has additionally proposed using the Fire Protection Program. The GALL Report line item referenced is the steel elements and, therefore, the GALL Report recommends AMP XI.S1 and XI.S4. The applicant stated that the AMR result line items that reference LRA table 3.5.1 item 3.5.1-18 is also located in the areas subject to general corrosion and, therefore, the Fire Protection Program was also credited. Since the Fire Protection Program, ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J require visual inspections on a periodic basis 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 additional use of the Fire Protection 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 AERM adequately, as recommended by the GALL Report.

3.5.2.1.3 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. The applicant stated that the Fire Protection Program will also be used to manage the aging effect/mechanism in areas relied upon as fire barriers. During the review, the staff noted that for the AMR results line pointing to Table 3.5.1, item 3.5.1-43, for four groups the applicant included a reference to Note E and plant-specific Note 30, which states "These masonry walls are not safety-related, and are relied upon to perform a function that demonstrates compliance with a regulated event(s)."
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The staff reviewed the AMR results lines referenced to Note E, plant-specific Note 30, 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 additionally proposed using the Fire Protection Program. The GALL Report line item referenced is concrete block walls and the GALL Report recommends AMP XI.S5. The applicant stated that the AMR result line items that reference LRA table 3.5.1 item 3.5.1-43 are also located in areas that are relied upon as fire barriers, and the Fire Protection Program was also credited. Since the Fire Protection Program and Masonry Wall Program require visual inspections on a periodic basis to manage cracking due to restraint shrinkage, creep, and aggressive environment, the staff finds the applicant's additional use of the Fire Protection 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 AERM adequately.

3.5.2.1.4 Cracking Due to Stress Corrosion Cracking; Loss of Material Due to Pitting and Crevice Corrosion.

In the discussion section of LRA Table 3.5.1, item 3.5.1-46, the applicant stated that cracking due to SCC and loss of material due to pitting and crevice corrosion are managed by the Water Chemistry Program. The applicant stated that the Structures Monitoring Program will also be used to manage the aging effect/mechanism in areas subject to pitting and crevice corrosion. During the review, the staff noted that for the AMR results line pointing to Table 3.5.1, item 3.5.1-46, for two groups the applicant included a reference to Note E and plant-specific Note 16, which states, "NUREG-1801 line item material/environment combination is used to identify stainless steel sump liners in treated borated water. The Structures Monitoring Program is used to manage the aging effects cracking due to SCC and loss of material due to pitting and crevice corrosion for stainless steel sump liners rather then the NUREG referenced Water Chemistry Program since water quality in the sumps is not monitored."

The staff reviewed the AMR results lines referenced to Note E and plant-specific Note 16. The staff 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.M2, “Water Chemistry Program,” the applicant has additionally proposed using the Structures Monitoring Program. The GALL Report line item referenced is stainless steel sump liners, and the GALL Report recommends AMP XI.M2. The applicant stated that the AMR result line items that reference LRA Table 3.5.1 item 3.5.1-46 is also located in the treated borated water areas subject to cracking and loss of material due to pitting and crevice corrosion, and the Structures Monitoring Program was also credited. Since the Water Chemistry Program and Structures Monitoring Program are performing visual inspections on a periodic basis to manage cracking and loss of material due to pitting and crevice corrosion, the staff finds the applicant's additional 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 AERM adequately.

3.5.2.1.5 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 (steel only)/pitting and crevice corrosion is managed by RG 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants. The applicant stated that the Structures Monitoring Program will also be used to manage the aging effect/mechanism in areas subject to loss of material due to general (steel only)/pitting and crevice corrosion. During the review, the staff noted that for the AMR results line pointing to Table 3.5.1, item 3.5.1-47, for two groups the applicant included a reference to Note E and plant-specific Notes 3, 4, and 31, which state “Aging mechanism(s) not in NUREG-1801,” “The component is buried and inaccessible for examination. The Structures Monitoring Program requires examination of buried structural members whenever the surrounding soil is excavated. Observed condition of excavated members is used as a basis for evaluating the condition of inaccessible structural members," and “The Bolting Integrity Program provides preventive measures and maintenance practices for structural bolting.”

The staff reviewed the AMR results lines referenced to Note E, plant-specific Note 3, 4, and 31, 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, “RG 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants,” the applicant has additionally proposed using the Structures Monitoring Program. The GALL Report line item referenced is steel only, and therefore, the GALL Report recommends AMP XI.S7. The applicant stated that the AMR result line items that reference LRA table 3.5.1 item 3.5.1-47 is also located in the groundwater/soil environment areas subject to loss of material due to general, and therefore, the Structures Monitoring Program was also credited. Since the RG 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants and Structures Monitoring Program are performing visual inspections whenever the surrounding soil is excavated, the staff finds the applicant's additional 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 AERM adequately, as recommended by the GALL Report.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent 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).

3.5.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.5.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the containments, structures, and component supports components and provides information concerning how it will manage aging effects in the following three areas:

PWR and BWR containments:

(1) PWR and BWR containments

- aging of inaccessible concrete areas
- cracks and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations if not covered by the Structures Monitoring Program
- reduction of strength and modulus of concrete structures due to elevated temperature
- loss of material due to general, pitting, and crevice corrosion
- loss of prestress due to relaxation, shrinkage, creep, and elevated temperature
- cumulative fatigue damage
- cracking due to SCC
- cracking due to cyclic loading
- loss of material (scaling, cracking, and spalling) due to freeze-thaw
- cracking due to expansion and reaction with aggregate and increase in porosity and permeability due to leaching of calcium hydroxide

(2) safety-related and other structures and component supports:

- aging of structures not covered by the Structures Monitoring Program
- aging management of inaccessible areas

- reduction of strength and modulus of concrete structures due to elevated temperature
- aging management of inaccessible areas for Group6 structures
- cracking due to SCC and loss of material due to pitting and crevice corrosion
- aging of supports not covered by the Structures Monitoring Program
- cumulative fatigue damage due to cyclic loading

(3) QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the report recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.5.2.2. The staff's review of the applicant's further evaluation follows.

3.5.2.2.1 PWR and BWR Containments

The staff reviewed LRA Section 3.5.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.1, which addresses several areas:

Aging of Inaccessible Concrete Areas. LRA Section 3.5.2.2.1.1 states that PINGP has no ASME Section III, Division 2 Class CC concrete subject to IWL in-service inspection requirements. The free standing steel containment (i.e. Reactor Containment Vessel) is supported by unreinforced concrete, but this concrete does not serve a pressure retaining function. Therefore, it is not subject to IWL inspections. The LRA further states that aging of this unreinforced concrete is managed by the Structures Monitoring Program.

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 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. However, the GALL Report recommends further evaluation of plant-specific programs to manage aging effects for inaccessible areas if the environment is aggressive.

The staff confirmed that no PINGP containment concrete serves a pressure retaining function. Therefore, the concrete is not subject to IWL inspections or further evaluation. Aging of the unreinforced containment concrete is managed by the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.18. SER Section 3.5.2.2.2.2 documents the staff's review of the applicant's evaluation of aging management of inaccessible areas, including the unreinforced concrete.

Cracks and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking, and Differential Settlement Due to Erosion of Porous Concrete

Subfoundations, If Not Covered by the Structures Monitoring Program. LRA Section 3.5.2.2.1.2 states that PINGP has no ASME Section III, Division 2 Class CC concrete subject to IWL in-service inspection requirements. The free standing steel containment (i.e. reactor containment vessel) is supported by unreinforced concrete, but this concrete does not serve a pressure retaining function. Therefore, it is not subject to IWL inspections. The LRA further states that settlement of this unreinforced concrete is managed by the Structures Monitoring Program.

The staff reviewed LRA Section 3.5.2.2.1.2 against the criteria in SRP-LR Section 3.5.2.2.1.2 which states that cracks and distortion due to settlement could occur in concrete and steel containments. Also, reduction of foundation strength and differential settlement due to erosion of porous concrete subfoundations could occur in all types of containments. The existing program relies on structures monitoring program to manage these aging effects. The GALL Report recommends no further evaluation if this activity is within scope of the applicant's Structures Monitoring Program.

The staff confirmed that no PINGP containment concrete serves a pressure retaining function; therefore, the concrete does not need to be evaluated in this section. SER Section 3.5.2.2.2.2 documents the staff's review of the applicant's evaluation of settlement in inaccessible areas, including the unreinforced concrete. The staff confirmed that the settlement of the unreinforced concrete is managed under the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17.

Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature. LRA Section 3.5.2.2.1.3 states the temperature of the unreinforced concrete beneath containment remains well below the allowable limits of International System (SI) Units general and SI Units local. Since the temperature remains below the limits, the applicant stated the aging effect is not applicable.

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 recommends further evaluation of plant-specific AMPs if any portion of the concrete containment components exceeds the specified temperature limits of SI Units general and SI Units local.

The staff finds acceptable the applicant's evaluation that this aging effect is not applicable because the concrete remains below the allowable temperature limits.

Loss of Material due to General, Pitting and Crevice Corrosion. LRA Section 3.5.2.2.1.4 addresses loss of material due to general, pitting and crevice corrosion for steel elements of accessible and inaccessible areas of containments, stating that the ASME Section XI, Subsection IWE and the 10 CFR 50 Appendix J Programs are recommended to manage this aging effect. The applicant stated that the GALL Report recommends further evaluation of plant-specific programs to manage this aging effect for inaccessible areas if corrosion is significant. The applicant further stated that corrosion was not significant for inaccessible steel components embedded in concrete because the four criteria listed in the GALL Report had been reviewed and satisfied.

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 further evaluation is necessary if corrosion is significant. GALL Report item

II.A2-9 states that corrosion is not significant for inaccessible areas of steel containments (embedded containment steel shell or liner) if the following four conditions are satisfied:

(1) Concrete meeting the requirements of ACI 318 or 349 and the guidance of ACI 201.2R was used for the containment concrete in contact with the embedded containment shell or liner.

(2) The concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner.

(3) The moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with ASME Section XI, Subsection IWE requirements.

(4) Borated water spills and water ponding on the containment concrete floor are not common and when detected are cleaned up in a timely manner.

The staff reviewed the construction codes and standards for PINGP and found that the concrete was designed in accordance with ACI 318. Additional ASTM and ACI standards were followed during construction which ensure the concrete was placed in accordance with guidance in ACI 201.2R. Further discussion of the acceptability of PINGP concrete is documented in SER Sections 3.5.2.2.2.2.1 and 3.5.2.2.2.2.2. During its audit, the staff noted an ongoing issue with water seepage from the refueling cavity, through concrete inside containment, into the containment sumps. [This is inconsistent with the applicant's claim that the concrete meets the second criteria listed in the GALL Report.] To address this issue, the staff issued RAI B2.1.38-2, which is discussed and documented under the Structures Monitoring Program in SER Section 3.0.3.2.17. In the LRA, the applicant stated that aging effects for the moisture barrier are managed by the ASME Section XI, Subsection IWE Program. The staff's review of the applicant's ASME Section XI, Subsection IWE Program is documented in SER Section 3.0.3.1.4. The applicant also stated that borated water spills are managed by the Boric Acid Corrosion Program. The staff's review of the applicant's Boric Acid Corrosion Program is documented in SER Section 3.0.3.1.6.

The staff is currently reviewing information on the refueling cavity water seepage provided in response to RAI B2.1.38-2 and follow-up RAI B2.1.38, as well as during a public meeting on March 2, 2009. **This is Open Item 3.0.3.2.17-01**, and is discussed further in Structures Monitoring Program and ASME XI, Subsection IWE Program evaluation sections of the SER.

<u>Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature</u>. LRA Section 3.5.2.2.1.5 states that loss of prestress of concrete containments is not applicable since PINGP containments are free standing steel containments.

The staff finds acceptable the applicant's evaluation that this aging effect is not applicable on the basis that the PINGP containments are free standing steel containments with no prestressed concrete.

<u>Cumulative Fatigue Damage</u>. Cumulative fatigue damage is a TLAA. SER Section 4.6. documents the staff's review of the applicant's evaluation of this TLAA.

Cracking due to Stress Corrosion Cracking (SCC). LRA section 3.5.2.2.1.7 states that PINGP OE has shown no age-related issues on bellow replacement and industry OE has identified cracks in the bellows, but not the weld metal. The LRA further states that the penetration bellow assembly welds are located in a sheltered, non-corrosive environment, where temperatures are not expected to exceed threshold limits for SCC. Since the environment is not corrosive and the temperature does not exceed limits, the LRA states that the components do not require additional inspections and the aging effects can be adequately managed under the ASME Section XI, Subsection IWE and 10 CFR 50 Appendix J Programs.

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 SCC of stainless steel penetration sleeves and dissimilar metal welds can occur in all types of PWR and BWR containments. Additional examinations or evaluations may need to be implemented to detect these aging effects.

GALL Report item II.A3-2 states that SCC may cause aging effects if the material is not shielded from a corrosive environment. Chapter IX.D of the GALL Report also states that SCC very rarely occurs in austenitic stainless steels below,140 ºF and the observed instances of SCC below 140 ºF occurred in an environment with significant presence of contaminants. The staff is not clear what temperature and chemical elements these components have experienced. Therefore, RAI 3.5.2.2-2 dated December 18, 2008, was issued to ask the applicant to (1) provide the history of the highest temperature that stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds have experienced, and (2) demonstrate that chemical elements that would support SCC have been monitored or measured to ensure a non-aggressive chemical environment.

In its response to RAI 3.5.2.2-2, dated January 20, 2009, the applicant stated that the components are located inside the shield building in an air indoor environment which is not corrosive. The applicant further stated that the PINGP indoor environment is not corrosive based on the following facts: (1) the plant draws its cooling water from the Mississippi River, a fresh water source, so it is not exposed to a salt air/water environment, and (2) the air quality around the plant is better than the established National Ambient Air Quality Standards for the six criteria pollutants. The applicant stated that SCC requires simultaneous action of a corrosive environment and temperatures in excess of 140 ºF, and since the environment was not corrosive the elements were not susceptible to SCC.

The staff reviewed the applicant's response to RAI 3.5.2.2-2 and agreed that the components are not exposed to a corrosive environment. On the basis of its review, the staff determines that additional inspections of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds is not applicable to PINGP because the conditions necessary for SCC, both high temperature (>140 °F) and exposure to a corrosive environment, do not exist simultaneously.

Cracking due to Cyclic Loading. The PINGP containment penetrations that experience significant cyclic loading have fatigue analyses that are evaluated as TLAAs. SER Section 4.6 "Containment and Penetration Fatigue Analysis" documents the staff's review of the applicant's evaluation of these TLAAs.

Loss of Material (Scaling, Cracking, and Spalling) Due to Freeze–Thaw. LRA Section 3.5.2.2.1.9 states that loss of material due to freeze-thaw is not applicable to the unreinforced concrete below containment since the concrete is not exposed to outdoor air or groundwater/soil environments.

The staff reviewed LRA Section 3.5.2.2.1.9 against the criteria in SRP-LR Section 3.5.2.2.1.9 which recommends further evaluation of loss of material due to freeze-thaw for plants with concrete containments located in moderate to severe weathering conditions.

The staff finds acceptable the applicant's evaluation that this aging effect is not applicable to the unreinforced concrete below the free standing steel containment because the concrete will not be subjected to freeze-thaw cycles since it is not exposed to outdoor air.

Cracking Due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability, Due to Leaching of Calcium Hydroxide. LRA Section 3.5.2.2.1.10 states that PINGP has no ASME Section III, Division 2 Class CC concrete subject to IWL in-service inspection requirements. The free standing steel containment (i.e. Reactor Containment Vessel) is supported by unreinforced concrete, but this concrete does not serve a pressure retaining function. The LRA also states that leaching of calcium hydroxide for the unreinforced concrete beneath containment is not applicable since it is not exposed to flowing water or a head of standing water. The LRA further states that cracking due to reactions with aggregate and increases in porosity of this unreinforced concrete are managed by the Structures Monitoring Program.

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. The GALL Report recommends further evaluation if concrete was not constructed in accordance with the recommendations in ACI 201.2R-77.

The staff confirmed that no PINGP containment concrete serves a pressure retaining function. Therefore, the concrete does not need to be evaluated in this section. SER Section 3.5.2.2.2.2 documents the staff's review of the applicant's evaluation of cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide. The staff confirmed that aggregate reaction aging effects for the unreinforced concrete are managed by the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17

Based on the programs and analyses discussed above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.1. For those line items that apply to LRA Section 3.5.2.2.1, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

The staff reviewed LRA Section 3.5.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.2, which addresses several areas:

Aging of Structures Not Covered by Structures Monitoring Program. LRA Section 3.5.2.2.2.1 states that PINGP concrete structures subject to the aging effects discussed below are included in the Structures Monitoring Program. Aging effects discussed below for structural steel items are also addressed by the Structures Monitoring Program. Additional discussion of specific aging effects follows.

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, including (1) cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for Groups 1-5, 7, and 9 structures; (2) increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, and 9 structures; (3) loss of material due to corrosion for Groups 1-5, 7, and 8 structures; (4) loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, and 7-9 structures; (5) cracking due to expansion and reaction with aggregates for Groups 1-5 and 7-9 structures; (6) cracks and distortion due to increased stress levels from settlement for Groups 1-3 and 5-9 structures; and (7) reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation for Groups 1-3 and 5-9 structures.

In addition, lock-up due to wear may occur for Lubrite radial beam seats in RPV support shoes for PWRs with nozzle supports, steam generator supports, and other sliding support bearings and sliding support surfaces. The existing program relies on the structures monitoring program or ASME Code Section XI, Subsection IWF, to manage this aging effect. The GALL Report recommends further evaluation only for structure-aging effect combinations not within the Inservice Inspection (IWF) or Structures Monitoring Programs.

(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 cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for accessible concrete areas of Groups 1-5, 7 and 9 structures is managed by the Structures Monitoring Program.

The staff's reviews for the cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for inaccessible concrete elements of containments and Groups 1-5, 7 and 9 structures are documented in SER Sections 3.5.2.2.1.1 and 3.5.2.2.2.2.4, respectively. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff confirmed that groups 1-5, 7, and 9 structures subject to this AMR are all in-scope of the Structures Monitoring Program. 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.

(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 increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for accessible concrete areas of Groups 1-5, 7, and 9 structures is managed by the Structures Monitoring Program.

The staff's reviews for the increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for inaccessible concrete elements of containments and Groups 1-5, 7 and 9 structures are documented in SER Sections 3.5.2.2.1.1 and 3.5.2.2.2.2.4, respectively. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff confirmed that Groups 1-5, 7 and 9 structures subject to this AMR are all in-scope of the Structures Monitoring Program. 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.

(3) Loss of Material Due to Corrosion for Groups 1-5, 7, and 8 Structures

The applicant stated in the LRA that loss of material due to corrosion for structural steel components is managed by the Structures Monitoring Program.

The staff's review for the loss of material due to general, pitting and crevice corrosion for steel elements of containments is documented in SER Section 3.5.2.2.1.4. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff confirmed that Groups 1-5, 7, 8 structures subject to this AMR are all in-scope of the Structures Monitoring Program. 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.

(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 loss of material (spalling, scaling) and cracking due to freeze-thaw for accessible concrete areas of Groups 1-5, 7, and 9 structures is managed by the Structures Monitoring Program.

The staff's reviews for the loss of material (spalling, scaling) and cracking due to freeze-thaw for concrete elements of containments, below–grade inaccessible concrete areas of Groups 1-3, 5, 7- 9 structures, and below–grade inaccessible concrete areas of Groups 6 Structures are documented in SER Sections 3.5.2.2.1.9, 3.5.2.2.2.2.1 and 3.5.2.2.2.4.2, respectively. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff confirmed that Groups 1-3, 5, 7- 9 structures subject to this AMR are all in-scope of the Structures Monitoring Program. 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.

(5) Cracking Due to Expansion and Reaction with Aggregates for Groups 1-5 and 7-9 Structures

The applicant stated in the LRA that cracking due to expansion and reaction with aggregates for accessible concrete areas of Groups 1-5, 7, and 9 structures is managed by the Structures Monitoring Program.

The staff's reviews for the cracking due to expansion and reaction with aggregates for concrete elements of containments and inaccessible areas of Groups 1-5 and 7-9 structures are documented in SER Sections 3.5.2.2.1.10 and 3.5.2.2.2.2.2, respectively. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff confirmed that Groups 1-5, 7- 9 structures subject to this AMR are all in-scope of the Structures Monitoring Program. 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.

(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 cracks and distortion due to increased stress levels from settlement of groups 1-3 and 5-9 structures are managed by the Structures Monitoring Program.

The staff's reviews for cracks and distortion due to increased stress levels from settlement for concrete elements of containments and inaccessible areas of Groups 1-3 and 7-9 structures are documented in SER Sections 3.5.2.2.1.2 and 3.5.2.2.2.2.3, respectively. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff confirmed that Groups 1-3, 7- 9 structures subject to this AMR are all in-scope of the Structures Monitoring Program. 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.

(7) Reduction in Foundation Strength, Cracking, and Differential Settlement Due to Erosion of Porous Concrete Subfoundation for Groups 1-3 and 5-9 Structures

The applicant stated in the LRA that reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations for groups 1-3 and 5-9 structures is not applicable because PINGP does not have porous subfoundations.

Based on the review of documents supporting the LRA, the staff agrees this aging affect is not applicable because PINGP has no porous concrete subfoundations.

(8) Lockup Due to Wear for Lubrite® Radial Beam Seats in Other Sliding Support Surfaces

The applicant stated in the LRA that lockup due to wear for sliding support surfaces of the RPV support shoes is managed by the ASME Section XI, Subsection IWF Program. The LRA further states that the steam generator supports do not incorporate sliding surfaces.

The staff finds that RPV support shoes are all in-scope of the applicant's ASME Section XI, Subsection IWF Program. The staff's review of the ASME Section XI, Subsection IWF Program is documented in SER Section 3.0.3.1.5. The applicant stated in LRA Section 3.5.2.2.2.1 that the ASME Section XI, Subsection IWF Program will perform inspections to confirm the absence of lock-up due to wear aging effect for these components. 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.

Based on the programs and analyses discussed above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1. For those line items that apply to LRA Section 3.5.2.2.2.1, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging Management of Inaccessible Areas. The staff reviewed LRA Section 3.5.2.2.2.2 against the following criteria in SRP-LR Section 3.5.2.2.2.2:

(1) Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

In LRA Section 3.5.2.2.2.2.1 the applicant stated that PINGP is located in a severe weathering area and therefore an evaluation must be done to determine if freeze-thaw cycles will have an effect on concrete structures. The applicant stated that the concrete design conforms to ACI 318, the entrained air content of the concrete was specified between 4% and 8%, and the water-to-cement ratio was specified not to exceed 0.46. The applicant also stated that the Structures Monitoring Program will examine accessible areas of concrete structures for evidence of freeze-thaw induced degradation. These inspections will be used to assess the impact of freeze-thaw on inaccessible areas. The applicant further stated that compliance with industry code requirements and the absence of any significant freeze-thaw degradation shows that this aging affect is not significant.

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 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 GALL Report suggests a water-to-cement ratio between 0.35 and 0.45. Although the PINGP water-to-cement ratio specification value is not to exceed 0.46, the staff finds this value acceptable because the 0.01 difference between upper bounds is negligible. The ‘not to exceed’ portion of the PINGP specification is also acceptable because, per ACI codes, the strength and durability of concrete increases as the water-to-cement ratio decreases. According to ACI 318 and ACI 201.2R, the maximum water-to-cement ratios of 0.40 to 0.50 that may be required for concretes exposed to aggressive environments will typically be equivalent to requiring compressive strengths of 5000 to 4000 psi, respectively. Therefore, as long as the workability of the concrete is maintained, a lower water-to-cement ratio provides a more durable concrete with a higher compressive strength. Also protection from the freeze-thaw phenomenon is influenced more by the amount of air-entrainment than the water-to-cement ratio. This is reflected in the recent NRC interim staff guidance ISG-03, which removes the water-to-cement ratio from the evaluation of degradation due to freeze-thaw.

The GALL Report suggests an air content of 3% to 6%. The staff finds the 4% to 8% value specified at PINGP acceptable because the recommended air content for concrete resistance to freezing and thawing by ACI 201.2R is 4.5% to 7.5 % for severe exposure and 3.5% to 6% for moderate exposure with a ±1.5% tolerance. PINGP is located in a severe weathering region so the 4% to 8% air content falls within the ACI recommendations when the available tolerance is taken into consideration. The sufficient concrete air content 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. The staff found that the PINGP concrete mix design adequately addressed freeze-thaw damage potential by using entrained air and aggregate soundness for structures subject to freezing in the subgrade freeze zone and in water-tight structures. In addition, potential freeze-thaw effects on the inaccessible concrete are assessed by monitoring the accessible concrete under the Structures Monitoring Program. The staff's review of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17.

On the basis of its review, the staff finds that the 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 is not significant. Therefore, no additional plant-specific program is required.

(2) Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures.

In LRA Section 3.5.2.2.2.2.2 the applicant states that cracking due to reaction with aggregates is not significant because tests in accordance with ASTM C289 verified that non-reactive aggregates were used.

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 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 issued RAI 3.5.2.2-1 in a letter dated December 18, 2008, asking the applicant to provide a discussion and basis for the determination that ASTM C289 satisfies the requirements of ASTM C227 and C295 as suggested by GALL Report item III.A1-2.

In its response to RAI 3.5.2.2-1, dated January 20, 2009, the applicant stated that ASTM Specification C295 is included in the PINGP UFSAR Section 12.2.3.2 on a list of standards and specifications for concrete materials, and should have been included in LRA Section 3.5.2.2.2.2.2. The staff verified that ASTM C295 was included in the UFSAR list, and found that ASTM C227 was also on the list of standards and specifications. Since both GALL recommended ASTM standards were used to verify that PINGP aggregates were non-reactive, the staff's concern is resolved.

The staff also reviewed the construction codes and standards for PINGP and found that the concrete was designed in accordance with ACI 318. Additional ASTM and ACI standards were followed during construction which ensures the concrete was placed in accordance with guidance in ACI 201.2R-77.

On the basis of its review, the staff finds that the aggregates used at PINGP are non-reactive, and the concrete was constructed in accordance with the recommendations in ACI 201.2R-77. Therefore, cracking due to expansion and reaction with aggregate in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures are not aging effects for concrete elements and no additional plant-specific program is required.

(3) Cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures.

In LRA Section 3.5.2.2.2.2.3 the applicant stated that the auxiliary building, turbine building and shield buildings were constructed on a continuous mat foundation which was built on a 30 foot layer of densely compacted materials. The LRA further states that de-watering systems are not used at PINGP and are not credited in the CLB. Operating experience shows no evidence of significant building settlement, and to ensure unexpected settlement does not occur, the Structures Monitoring Program manages cracks due to settlement. The LRA further states that PINGP does not have porous concrete subfoundations.

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 the GALL Report recommends verification of the continued functionality of the de-watering system during the period of extended operation, if the plant's CLB credits a de-watering system. The GALL Report recommends no further evaluation if this activity and these aging effects are included in the scope of the applicant's Structures Monitoring Program.

On the basis of its review, the staff determines 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 in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures are not plausible aging effects due to the absence of these aging mechanisms. PINGP does not use a de-watering system, and there are no porous subfoundations on the site. In addition, the applicant elected to monitor the above-grade exposed containment concrete for the aging effect of cracking due to settlement with the Structures Monitoring Program. The staff reviewed the Structures Monitoring Program, and the evaluation is documented in SER Section 3.0.3.2.17. The staff finds that this program is consistent with the recommendations in the GALL Report, and is 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.

(4) 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.

In LRA Section 3.5.2.2.2.2.4 the applicant stated that the above aging effect does not require further evaluation since the groundwater was found to be non-aggressive. The LRA also included chemistry test results for groundwater over the last 22 years: pH ranging from 7.6 to 8.5, maximum chloride concentration of 89.4 ppm, and maximum sulfate concentration of 119 ppm.

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 the GALL Report recommends further evaluation of plant-specific programs to manage these aging effects in inaccessible areas of these Groups of structures if the environment is aggressive.

The GALL Report recommends periodic groundwater inspection for chlorides, sulfates, and pH to ensure non-aggressive groundwater chemistries, as well as examination of exposed portions of below-grade concrete whenever excavated. The staff noted that the applicant's groundwater inspection program is under the applicant's Structures Monitoring Program. RAI B2.1.38-1 was issued to ask the applicant to specify the location(s) where tests samples were/are taken relative to the safety-related and important-to-safety embedded concrete and to explain the technical basis for concluding that sampling a single well is sufficient to ensure the embedded concrete is not exposed to aggressive groundwater. The staff's review of the applicant's Structures Monitoring Program including responses to RAI B2.1.38-1 is documented in SER Section 3.0.3.2.17. The basis document for the Structural Monitoring Program indicated a five year interval for monitoring the below-grade water chemistry. The staff agreed that this sampling period is in accordance with the industry's standard. The staff also verified that the historic results were within the GALL Report limits, which are greater than 5.5 for pH; less than 500 ppm for chlorides; and less than 1500 ppm for sulfates. The staff also noted that the applicant's Structures Monitoring Program includes examinations of below-grade concrete when exposed for any reason.

On the basis of its review, the staff finds that the 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 in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures requires no further evaluation because the environment is not aggressive and the groundwater chemistry inspection under the applicant's Structures Monitoring Program agrees with the recommendation of the GALL Report.

(5) 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

In LRA Section 3.5.2.2.2.2.5 the applicant stated that PINGP documents confirm that the concrete was constructed in accordance with the recommendations in ACI 201.2R-77, and therefore aging management due to leaching of calcium hydroxide is not necessary.

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 the GALL Report recommends further evaluation of this aging effect for inaccessible areas of Groups 1-3, 5 and 7-9 structures if concrete was not constructed in accordance with the recommendations in ACI 201.2R-77 for a quality concrete with low water-to-cement ratio (0.35 – 0.45), smaller aggregate, long curing period, adequate air entrainment (3 – 6%), and thorough consolidation. The staff's discussion and review of the equivalence of PINGP concrete to the ACI 201.2R-77 recommendations is documented in SER Sections 3.5.2.2.2.2.1 and 3.5.2.2.2.2.2.

On the basis of its review, the staff finds that increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures is not a plausible aging effect requiring management because the design and construction of concrete structures in accordance with ACI codes enhances resistance to leaching.

Based on the programs and analyses discussed above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2. For those line items that apply to LRA Section 3.5.2.2.2.2, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature. In LRA Section 3.5.2.2.2.3 the applicant addresses reduction of concrete strength and modulus due to elevated temperatures that may occur in PWR and BWR Groups 1-5 concrete structures. The applicant stated that three locations at PINGP require further evaluation due to elevated temperatures. These include the shield building walls adjacent to hot piping penetrations, screenhouse and diesel generator building concrete adjacent to non-insulated exhaust lines, and the reactor biological shield wall. The PINGP LRA states that the maximum concrete temperature in the shield building walls is 158 °F. The applicant states that this temperature is localized and falls below the 200 °F limit, therefore no further evaluation is necessary. The LRA also states that no concrete temperatures have been measured at the diesel exhaust lines. Since the temperature may exceed the limits, aging management is provided by examinations under the RG 1.127, Inspection of Water-Control Structures and the Structures Monitoring Programs. The PINGP LRA further states that the maximum calculated concrete temperature in the biological shield wall is 195 °F. The applicant performed an evaluation to ensure that the elevated temperatures would not affect structural integrity.

The staff reviewed LRA Section 3.5.2.2.2.3 against the criteria in SRP-LR Section 3.5.2.2.2.3 which states that reduction of strength and modulus of concrete due to elevated temperatures may occur in PWR and BWR Groups 1-5 concrete structures. For concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A to ACI 349-85 specifies the concrete temperature limits for normal operation or any other long-term period. Temperatures shall not exceed 150 °F except for local areas allowed to have temperatures not to exceed 200°F.

During its review, the staff verified that the 158 °F temperature in the shield building walls is a localized temperature which falls below the 200 °F limit, therefore the staff agrees no further evaluation is necessary. GALL Report item III.A3-1 specifies temperature limits (150 °F general and 200°F local) for normal operation or any other long-term period (30 or more days) per ACI

349-85. The diesel generators are only run periodically or during accident conditions, so the concrete surrounding the exhaust lines will not exceed the temperature limits for a long-term period; therefore, the staff believes no further evaluation is necessary. Conservatively the applicant proposed to examine the concrete adjacent to the non-insulated diesel exhaust lines under the Structures Monitoring and RG 1.127, Inspection of Water-Control Structures Programs. The staff's reviews of the applicant's RG 1.127, Inspection of Water-Control Structures and Structures Monitoring Programs are documented in SER Sections 3.0.3.2.14 and 3.0.3.2.17, respectively. During the audit, the applicant explained, and the staff agreed, that the 195 °F temperature in the biological shield wall is considered to be a localized temperature and therefore falls below the 200 °F limit. However, the applicant performed an evaluation to ensure that the elevated temperatures would not affect structural integrity. The staff reviewed the analysis and confirmed that the biological shield wall could support the applied stresses with the reduced concrete strength due to high temperatures. The staff also confirmed that the increased deflections due to the reduced modulus of elasticity would not affect the structural stability. In addition, aging management of the biological shield wall is provided by examinations under the Structures Monitoring Program.

The staff also noted there are six Table 3.5.2 line items, which cite neither an AERM nor AMP, which refer to the GALL Table 3.5.1-33 item which claims reduction of strength and modulus due to elevated temperature as the aging effect. The staff also noted that Note E is used by the applicant for these six line items. Note E states "Consistent with NUREG-1801 item for material, environment and aging effect, but a different AMP is credited or NUREG-1801 identifies a plant-specific aging management program." The GALL Table 3.51-33 item suggests further evaluation of plant-specific AMP if temperature limits are exceeded. GALL Report specifies temperature limits (150°F general and 200°F local) per ACI 349-85. The staff confirmed that the components of these six line items do not experience normal operating temperatures in excess of threshold levels. Therefore, the staff agrees there is no AERM for these components because the necessary condition does not exist.

Based on the programs and analyses discussed above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.3. For those line items that apply to LRA Section 3.5.2.2.2.3, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Aging Management of Inaccessible Areas for Group 6 Structures</u>. The staff reviewed LRA Section 3.5.2.2.2.4 against the following criteria in SRP-LR Section 3.5.2.2.2.4:

(1) Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due 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 Group 6 structures.

In LRA Section 3.5.2.2.2.4.1 the applicant stated that the above aging effects for concrete in accessible areas are managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The LRA also states that the aging effects are not significant for inaccessible concrete as discussed in LRA Section 3.5.2.2.2.2.4.

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 the GALL Report recommends further evaluation of plant-specific programs to manage these aging effects in inaccessible areas if the environment is aggressive. The staff's review for the increase in porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack and corrosion of embedded steel for inaccessible concrete elements is documented in SER Section 3.5.2.2.2.2.4. The staff's review of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is documented in SER Section 3.0.3.2.14 The staff confirmed that Group 6 structures subject to this AMR are in-scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program.

Since the environment is non-aggressive and the applicant has enhanced the Structures Monitoring Program to include periodic sampling of groundwater to ensure the environment remains non-aggressive, the staff finds that the criteria of SRP-LR Section 3.5.2.2.2.4.1 have been met.

(2) Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures.

In LRA Section 3.5.2.2.2.4.2 the applicant stated that loss of material (spalling, scaling) and cracking due to freeze-thaw for accessible concrete areas of Group 6 structures is managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The LRA also states that the aging effects are not significant for inaccessible concrete as discussed in LRA Section 3.5.2.2.2.2.1. To assure against degradation, the potential effects on inaccessible concrete are assessed by monitoring accessible concrete.

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 the GALL Report recommends further evaluation of this aging effect for inaccessible areas for plants located in moderate to severe weathering conditions. The staff's review for the loss of material (spalling, scaling) and cracking due to freeze-thaw for inaccessible concrete elements, including the applicant's further evaluation, is documented in SER Section 3.5.2.2.2.2.1. The staff's review of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is documented in SER Section 3.0.3.2.14. The staff confirmed that Group 6 structures subject to this AMR are in-scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program.

Since the applicant's concrete contains the appropriate air content and water-to-cement ration, as discussed in SER Section 3.5.2.2.2.2.1, the staff finds that the criteria of SRP-LR Section 3.5.2.2.2.4.2 have been met.

(3) 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.

In LRA Section 3.5.2.2.2.4.3 the applicant stated that cracking due to expansion and reaction with aggregates for accessible concrete areas of Group 6 structures is managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The LRA also states that the aging effects are not significant for inaccessible concrete as discussed in LRA Section 3.5.2.2.2.2.2.

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 the GALL Report recommends further evaluation of inaccessible areas if concrete was not constructed in accordance with the recommendations in ACI 201.2R-77. The staff's review for cracking due to expansion and reaction with aggregates for inaccessible concrete elements, including the review of the applicant's concrete, is documented in SER Section 3.5.2.2.2.2.2. The staff's review of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is documented in SER Section 3.0.3.2.14. The staff confirmed that Group 6 structures subject to this AMR are in-scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program.

Since the applicant's concrete was constructed in accordance with ACI 201.2R-77, as discussed in SER Section 3.5.2.2.2.2.2, the staff finds that further evaluation is not necessary, and the criteria of SRP-LR Section 3.5.2.2.2.4.3 have been met for cracking due to expansion and reaction with aggregates.

In LRA Section 3.5.2.2.2.4.3 the applicant further stated that an increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide for accessible concrete areas of Group 6 structures is managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The LRA also stated that the aging effects are not significant for inaccessible concrete as discussed in LRA Section 3.5.2.2.2.2.5.

The staff's review for an increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide for inaccessible concrete elements is documented in SER Section 3.5.2.2.2.2.5. The staff's review of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is documented in SER Section 3.0.3.2.15. The staff confirmed that Group 6 structures subject to this AMR are in-scope of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. Since the applicant's concrete was constructed in accordance with ACI 201.2R-77, as discussed in SER Section 3.5.2.2.2.2.5, the staff finds that further evaluation is not necessary, and the criteria of SRP-LR Section 3.5.2.2.2.4.3 have been met for an increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4. For those line items that apply to LRA Section 3.5.2.2.2.4, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion. LRA Section 3.5.2.2.2.5 states that liners for concrete and steel tanks are evaluated as mechanical components under Table I line items 3.2.1-49 and 3.2.1-53.

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 cracking due to SCC 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 confirmed that the PINGP refueling water storage tank liners are evaluated under Table I line items 3.2.1-49 and 3.2.1-53. The staff verified that the aging effects are managed by the Water Chemistry Program. The staff's review of the Water Chemistry Program is documented in SER Section 3.0.3.2.19.

Based on the program identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.5. For those line items that apply to LRA Section 3.5.2.2.2.5, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging of Supports Not Covered by Structures Monitoring Program. LRA Section 3.5.2.2.2.6 states that all the component/aging effect combinations mentioned in SRP-LR Section 3.5.2.2.2.6 are covered by the Structures Monitoring Program with one exception; Class 1 and Class 2 and 3 supports are managed by the ASME Section XI, Subsection IWF Program.

The staff reviewed LRA Section 3.5.2.2.2.6 against the following criteria in SRP-LR Section 3.5.2.2.2.6, which recommends further evaluation of certain component support/aging effect combinations if they are not covered by the Structures Monitoring Program. The staff confirmed that the component support/aging effect combinations of loss of material due to general and pitting corrosion, for Groups B2-B5 supports; reduction in concrete anchor capacity due to degradation of the surrounding concrete, for Groups B1-B5 supports; and reduction/loss of isolation function due to degradation of vibration isolation elements, for Group B4 supports; are managed by the Structures Monitoring Program, with the exception of Class 1 – 3 supports, which are managed by the ASME Section XI, Subsection IWF Program. The staff's review of the Structures Monitoring and ASME Section XI, Subsection IWF Programs are documented in SER Sections 3.0.3.2.17 and 3.0.3.1.5, respectively.

Based on the programs and analysis identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.6. For those line items that apply to LRA Section 3.5.2.2.2.6, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cumulative Fatigue Damage due to Cyclic Loading. LRA Section 3.5.2.2.2.7 states that fatigue of metal Class 1 component supports for the reactor pressure vessels and pressurizers is a TLAA and is addressed in Section 4.3. The LRA further states that the remaining Class 1 – 3 component supports do not include a fatigue analysis and are managed for aging by the ASME Section XI, Subsection IWF Program.

The staff's evaluation of the Class 1 component supports metal fatigue TLAA is documented in SER Section 4.3.

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 applicant's QA program.

3.5.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.5.2-1 through 3.5.2-4, 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 3.5.2-4, the applicant indicated, via notes F through J that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.5.2.3.1 Auxiliary and Turbine Buildings - Summary of Aging Management Review – LRA Table 3.5.2-1

The staff reviewed LRA Table 3.5.2-1, which summarizes the results of AMR evaluations for the auxiliary and turbine buildings component groups.

In LRA Table 3.5.2-1, the applicant identified 54 unique component/material/environment/aging effect/AMP groups for the Auxiliary and Turbine Buildings. Forty nine have AMR results consistent with the GALL Report, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Report line items are applicable.

For two component types, the applicant proposed to assign aluminum and stainless steel Table 1 line item 3.5.1-50 (III.B2-7) material, to the aging affect none and aging management program none. These line items reference Note I and plant-specific Note 13 and Note 14, which state "Aluminum roof hatch (hatch over concrete roof plug) is not susceptible to aging since the PINGP air outdoor environment is non-aggressive and dissimilar metal hatch connections are not used," and "NUREG-1801 line item includes the aging effect loss of material due to pitting and crevice corrosion where applicable. Loss of material due to pitting and crevice corrosion is not applicable at PINGP since the air outdoor environment does not contain aggressive contaminants and is not continuously wetted," respectively. [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.]

For one component type, the applicant proposed to manage roofing material, aging affect separation, environmental degradation, water in-leakage/weathering, 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 J and plant-specific Note 6, which states "Roofing components are not provided in NUREG-1801. PINGP plant-specific evaluation source document ACI 349.3R provided aging effects for roofing to include separation, environmental degradation, water in-leakage due to weathering." The staff finds that the credited AMP is appropriate because the Structures Monitoring Program performs visual inspections on a periodic basis to manage roofing material, aging affect separation, environmental degradation, and water in-leakage/weathering. Since the applicant has committed to an appropriate AMP for the period of extended operation, the staff finds these AMR results to be acceptable.

For one component type, the applicant proposed to manage ceramic (breakaway door pins) material, aging affect none and none for aging management. These line items reference Note J and plant-specific Note 9, which states "PINGP plant-specific evaluation did not identify any aging effect or mechanism for this material/environment combination." 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.

For the remaining one component type, the applicant proposed to manage wood (new fuel rack base support system) material, aging affect none and none for aging management. These line items reference Note J and plant-specific Note 12, which states "The PINGP new fuel pit bottom contains a layer of sand approximately 2 feet 3 inches thick topped with a 9 inches thick concrete slab that incorporates water stops. Wood planking is placed on top of the concrete slab at locations that correspond with the fuel racks. A concrete enclosure covers the new fuel pit. Since the wood planking is treated wood and is located in an air indoor environment, no aging effects are applicable." 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(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 Component Supports - Summary of Aging Management Review – LRA Table 3.5.2-2

The staff reviewed LRA Table 3.5.2-2, which summarizes the results of AMR evaluations for the component supports component groups.

In LRA Table 3.5.2-2, the applicant identified 104 unique component/material/environment/aging effect/AMP groups for the Component Supports. Seventy seven have AMR results consistent with the GALL Report, as identified by reference to Notes A through E. The staff confirmed that the references to Table 1 and GALL Report line items are applicable.

For one component type, the applicant proposed to manage reinforced concrete material, aging affect reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms, by using the RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants Program. The staff's review of the RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants Program is documented in SER Section 3.0.3.2.14. This line item references Note G and plant-specific Note 5, which states "SSC submerged in river (raw) water and accessible for diver examinations are identified as being in groundwater/soil (accessible) environment." The staff finds that the credited AMP is appropriate because the RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants Program performs visual inspections on a periodic basis to manage reinforced concrete material, aging affect reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms. Since the applicant has committed to an appropriate AMP for the period of extended operation, the staff finds these AMR results to be acceptable.

For two component types, the applicant state that aluminum, stainless steel (conduits, lighting fixtures, etc.) material have no aging affect none and require no aging management. These line items reference Note J and plant-specific Note 14, which states "NUREG-1801 line item includes the aging effect loss of material due to pitting and crevice corrosion where applicable. Loss of material due to pitting and crevice corrosion is not applicable at PINGP since the air outdoor environment does not contain aggressive contaminants and is not continuously wetted." 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.

For the remaining twenty four component types, the applicant state that aluminum and stainless steel insulation materials have no aging affect and require no aging management. These line items reference Note J and plant-specific Note 32, which states, "A review of PINGP operating experience confirms that insulation failures have not adversely impacted the satisfactory accomplishment of a safety-related intended function. Therefore, based upon the material, environment, and OE, the insulation is not expected to degrade, and an AMP is not required." 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(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 Cranes, Heavy Loads, Fuel Handling - Summary of Aging Management Review – LRA Table 3.5.2-3

The staff reviewed LRA Table 3.5.2-3, which summarizes the results of AMR evaluations for the cranes, heavy loads, and fuel handling component groups.

In LRA Table 3.5.2-3, the applicant identified 8 unique component/material/environment/aging effect/AMP groups for the Cranes, Heavy Loads, Fuel Handling. All eight have AMR results consistent with the GALL Report, 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 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 for the Cranes, Heavy Loads, Fuel Handling not evaluated in the GALL Report. The staff finds that the applicant has assured that the effects of aging will be adequately managed so that the intended function(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 D5/D6 Diesel Generator Building and Underground Storage Vault, Fuel Oil Transfer House, Old Service Building, and New Service Building – Summary of Aging Management - LRA Table 3.5.2-4

The staff reviewed LRA Table 3.5.2-4 which summarizes the results of AMR evaluations for the D5/D6 diesel generator building and underground storage vault, fuel oil transfer house, old service building, and new service building component groups.

In LRA Table 3.5.2-4, the applicant identified 39 unique component/material/environment/aging effect/AMP groups for the D5/D6 Diesel Generator Building and Underground Storage Vault, Fuel Oil Transfer House, Old Service Building, and New Service Building. Thirty six have AMR results consistent with the GALL Report, 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 applicable.

For one component type, the applicant proposed to manage aluminum (seismic gap covers at NSB and DGB) material, in an air-outdoor environment with an aging affect of loss of material/galvanic corrosion, 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. This line item references Note H and plant-specific Note 18, which states "Plant-specific review determined the potential use of dissimilar metal connections and therefore loss of material due to galvanic corrosion for aluminum is possible. In an outdoor environment that does not contain aggressive contaminants and is not continuously wetted, pitting and crevice corrosion are not applicable for aluminum." The staff finds that the credited AMP is appropriate, because the Structures Monitoring Program performs visual inspections on a periodic basis to manage aluminum (seismic gap covers at NSB and DGB) material, aging affect loss of material/galvanic corrosion. Since the applicant has committed to an appropriate AMP for the period of extended operation, the staff finds these AMR results to be acceptable.

For one component type, the applicant proposed to manage roofing material, aging affect separation, environmental degradation, water in-leakage/weathering, 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 J and plant-specific Note 6, which states "Roofing components are not provided in NUREG-1801. PINGP plant-specific evaluation source document ACI 349.3R provided aging effects for roofing to include separation, environmental degradation, and water in-leakage due to weathering." The staff finds that the credited AMP is appropriate, because the Structures Monitoring Program performs visual inspections on a periodic basis to manage roofing material, aging affects separation, environmental degradation, water in-leakage/weathering. Since the applicant has committed to an appropriate AMP for the period of extended operation, the staff finds these AMR results to be acceptable.

For the remaining one component type, the applicant proposed to manage reinforced concrete material, aging affect cracking and spalling/fatigue due to low level repeated load, 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 J and plant-specific Note 19, which states "It is possible that vibratory motion of the fuel oil storage vault roof slab during its use as an access roadway could cause gradual weakening and spalling in stress concentration areas. The Structures Monitoring Program is used to manage cracking and spalling due to fatigue due to low level repeated load." The staff finds that the credited AMP is appropriate because the Structures Monitoring Program performs visual inspections on a periodic basis to manage reinforced concrete material, aging affect cracking and spalling/fatigue due to low level repeated load. Since the applicant has committed to an appropriate AMP 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(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 Fire Protection Barriers - Summary of Aging Management Review – LRA Table 3.5.2-5

The staff reviewed LRA Table 3.5.2-5, which summarizes the results of AMR evaluations for the fire protection barriers component groups.

In LRA Table 3.5.2-5, the applicant identified 17 unique component/material/environment/aging effect/AMP groups for the Fire Protection Barriers. Fourteen have AMR results consistent with the GALL Report, 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 applicable.

For three component types, the applicant proposed to manage cementitious fireproofing and fire rated caulks and putties with smooth hard surface, rigid non-shrink mineral fiber board, fibrous fire rated, and rough surface (sprayed on or troweled) material, in an air-outdoor environment with an aging affect of loss of material/flaking, abrasion; cracking/vibration and movement; separation/vibration and movement, by using the Fire Protection Program. The staff's review of the Fire Protection Program is documented in SER Section 3.0.3.2.6. These line items reference Note J. The staff finds that the credited AMP is appropriate, because the Fire Protection Program performs visual inspections on a periodic basis to manage cementitious fireproofing and fire rated caulks and putties with smooth hard surface, rigid non-shrink mineral fiber board, fibrous fire rated, and rough surface (sprayed on or troweled) material, aging affect loss of material/flaking, abrasion; cracking/vibration and movement; separation/vibration and movement. Since the applicant has committed to an appropriate AMP 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(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 Radwaste Building, Old Administration Building, and Administration Building Addition - Summary of Aging Management Review – LRA Table 3.5.2-6

The staff reviewed LRA Table 3.5.2-6, which summarizes the results of AMR evaluations for the radwaste building, old administration building, and administration building addition component groups.

In LRA Table 3.5.2-6, the applicant identified 29 unique component/material/environment/aging effect/AMP groups for the Radwaste Building, Old Administration Building, and Administration Building Addition. All twenty nine have AMR results consistent with the GALL Report, 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 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).

3.5.2.3.7 Reactor Containment Vessels Units 1 and 2 - Summary of Aging Management Review – LRA Table 3.5.2-7

The staff reviewed LRA Table 3.5.2-7, which summarizes the results of AMR evaluations for the reactor containment vessels units 1 and 2 component groups.

In LRA Table 3.5.2-7, the applicant identified 42 unique component/material/environment/aging effect/AMP groups for the Reactor Containment Vessels Units 1 and 2. Thirty 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 applicable.

For one component type, the applicant proposed to manage steel for reactor containment vessel material, in an air-outdoor environment with an aging affect of cumulative fatigue damage/fatigue, by using the TLAA Section 4.6.1. The staff's review of the TLAA is documented in SER Section 4.6.1. This line item references Note H. The staff finds that the credited TLAA is appropriate because the TLAA Section 4.6.1 manages aging affect cumulative fatigue damage / fatigue. Since the applicant has committed to an appropriate TLAA for the period of extended operation, the staff finds these AMR results to be acceptable.

For the remaining three component types, the applicant proposed to manage unreinforced concrete material, in an air-outdoor environment with an aging affects of cracking, distortion, reaction with aggregates, loss of material (spalling/scaling), 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 F and plant-specific Note 23, which states "This line item addresses the unreinforced concrete placed between the Shield Building base mat/wall and the elliptical bottom head of the Reactor Containment Vessel. The top of the unreinforced concrete, which extends across the annular space between the Containment and Shield Building, is exposed to an indoor air environment. Elsewhere the unreinforced concrete is in contact with either the containment bottom head or the reinforced concrete Shield Building. The reinforced concrete base mat below the unreinforced concrete is an integral part of the Shield Building and is evaluated with the Shield Building. Since the unreinforced concrete is exposed to air indoor and embedded in concrete environments, the aging mechanisms settlement, reactions with aggregate and aggressive chemical attack are applicable, while elevated temperature, corrosion of embedded steel, leaching of calcium hydroxide, erosion of porous concrete subfoundation and freeze-thaw do not apply." The staff finds that the credited AMP is appropriate because the Structures Monitoring Program performs visual inspections on a periodic basis to manage unreinforced concrete material, aging affect cracking, distortion, reaction with aggregates, loss of material (spalling/scaling). Since the applicant has committed to an appropriate AMP 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(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 SBO Yard Structures - Summary of Aging Management Review – LRA Table 3.5.2-8

The staff reviewed LRA Table 3.5.2-8, which summarizes the results of AMR evaluations for the SBO yard structures component groups.

In LRA Table 3.5.2-8, the applicant identified 27 unique component/material/environment/aging effect/AMP groups for the SBO Yard Structures. All twenty seven have AMR results consistent with the GALL Report, 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 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).

3.5.2.3.9 Shield Buildings Units 1 and 2 - Summary of Aging Management Review – LRA Table 3.5.2-9

The staff reviewed LRA Table 3.5.2-9, which summarizes the results of AMR evaluations for the shield buildings units 1 and 2 component groups.

In LRA Table 3.5.2-9, the applicant identified 39 unique component/material/environment/aging effect/AMP groups for the Shield Buildings Units 1 and 2. All thirty 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 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).

3.5.2.3.10 Tank Foundations - Summary of Aging Management Review – LRA Table 3.5.2-10

The staff reviewed LRA Table 3.5.2-10, which summarizes the results of AMR evaluations for the tank foundations component groups.

In LRA Table 3.5.2-10, the applicant identified 19 unique component/material/environment/aging effect/AMP groups for the Tank Foundations. All nineteen 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 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).

3.5.2.3.11 Water Control Structures–Approach Canal, Emergency Cooling Water Intake, Intake Canal, and Screenhouse - Summary of Aging Management Review – LRA Table 3.5.2-11

The staff reviewed LRA Table 3.5.2-11, which summarizes the results of AMR evaluations for the water control structures component groups.

In LRA Table 3.5.2-11, the applicant identified 49 unique component/material/environment/aging effect/AMP groups for the Water Control Structures, Approach Canal, Emergency Cooling Water Intake, Intake Canal, and Screenhouse. Forty eight have AMR results consistent with the GALL Report, 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 applicable.

For one component type the applicant proposed to manage roofing material, in an air-outdoor environment with in aging affect of separation, environmental degradation, and water in-leakage/weathering, 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 J and plant-specific Note 6, which states "Roofing components are not provided in NUREG-1801. PINGP plant-specific evaluation source document ACI 349.3R provided aging effects for roofing to include separation, environmental degradation, water in-leakage due to weathering." The staff finds that the credited AMP is appropriate because the Structures Monitoring Program performs visual inspections on a periodic basis to manage roofing material, aging affects separation, environmental degradation, and water in-leakage/weathering. Since the applicant has committed to an appropriate AMP 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 not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the structures and component supports components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6 Aging Management of Electrical and Instrumentation and Controls System

The following information documents the staff's review of the applicant's AMR results for the electrical and instrumentation and control (I&C) components and component groups of:

- cables and connections (insulation), includes splices, terminations, fuse blocks and connectors
- cables and connections used in instrumentation circuits (insulation), sensitive to reduction in conductor insulation resistance
- inaccessible medium voltage cables and connections (insulation), underground, buried
- electrical connector contacts (metallic connector pins exposed to borated water)
- Electrical Penetrations (electrical insulation portions)
- metal enclosed bus and connections (bus/connections, enclosure assemblies, insulation/insulators)
- fuse holders (metallic parts), not part of a larger active assembly
- cable connections (metallic parts)
- switchyard bus and connections
- transmission conductors and connections
- high-voltage Insulators

3.6.1 Summary of Technical Information in the Application

LRA Section 3.6 provides AMR results for the electrical and I&C 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 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 (B3.1)	Consistent with the GALL Report (See Section 3.6.2.2.1)
Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements (3.6.1-2)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	No	Non-EQ Electrical Cables and Connections Visual Inspection Program (B2.1.12)	Consistent with the GALL Report (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 (B2.1.13)	Consistent with the GALL Report (See Section 3.6.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Conductor insulation for inaccessible medium voltage (2 kV to 35 kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements (3.6.1-4)	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements	No	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Program (B2.1.21)	Consistent with the GALL Report (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	Boric Acid Corrosion	No	Boric Acid Corrosion (B2.1.7)	Consistent with the GALL Report (See Section 3.6.2.1)
Fuse Holders (Not Part of a Larger Assembly): Fuse holders - metallic clamp (3.6.1-6)	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	No	Fuse Holders Program (B2.1.20)	Consistent with the GALL Report (See Section 3.6.2.1)
Metal enclosed bus - bus, connections (3.6.1-7)	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Metal Enclosed Bus Program (B2.1.26)	Consistent with the GALL Report (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 Program (B2.1.26)	Consistent with the GALL Report (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 (B2.1.38)	Consistent with the GALL Report (See Section 3.6.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Metal enclosed bus - enclosure assemblies (3.6.1-10)	Hardening and loss of strength due to elastomers degradation	Structures Monitoring Program	No	Structures Monitoring Program (B2.1.38)	Consistent with the GALL Report (See Section 3.6.2.1)
High-voltage insulators (3.6.1-11)	Degradation of insulation quality due to presence of any salt deposits and surface contamination; loss of material caused by mechanical wear due to wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes	None	Further evaluation (See SER Section 3.6.2.2.2)
Transmission conductors and connections; switchyard bus and connections (3.6.1-12)	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	A plant-specific aging management program is to be evaluated	Yes	None	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	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (B2.1.11)	Consistent with the GALL Report for the component, material, envrionment, and aging effect. AMP take some exception to GALL AMP (See Section 3.6.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Fuse Holders (Not Part of a Larger Assembly) - insulation material (3.6.1-14)	None	None	No	Not applicable	Consistent with the GALL report (See Section 3.6.2.1)

The staff's review of the electrical and I&C component groups followed one of several approaches, in one approach, 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. In the second approach, 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. In the third approach, 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:

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirement Program
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuit
- Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement Program
- Boric Acid Corrosion Program
- Metal Enclosed Bus Program
- Structure Monitoring Program
- Fuse Holder Program
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

In LRA Table 3.6.2-1, the applicant summarizes AMRs for the electrical and instrumentation and controls components.

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.

For each AMR line item, the applicant stated how the information in the tables aligns with the information in the GALL Report. The staff reviewed those AMRs including notes A through E, which indicate 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 is applicable and that the applicant identified the appropriate GALL Report AMRs. The staff evaluation follows.

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 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.

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. 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

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 3.6.1-1, 3.6.1-11 and 3.6.1-12 in Table 3.6.1 of the LRA. The staff also reviewed the applicant's evaluation to determine whether it adequately addressed the issues. In addition, the staff reviewed the applicant's evaluations against the criteria contained in SRP-LR Section 3.6.2.2. The staff's review is as follows.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

LRA Section 3.6.2.2.1 states that EQ of electrical equipment (Table 3.6.1, Item 3.6.1-1) 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, and Loss of Material Due to Mechanical Wear

In LRA Section 3.6.2.2.2 the applicant addressed degradation of insulator quality due to salt deposits or surface contamination and loss of material due to mechanical wear. The applicant stated that the high-voltage insulators subject to an AMR (1) are constructed of porcelain, galvanized metal, and cement, (2) are exposed to an outdoor weather environment consisting of temperatures up to 40 ºC (104 ºF), precipitation, and negligible radiation, (3) insulate and support an electrical conductor, and (4) require no AMP. The applicant also stated that that it did not identify any aging effects from the outside environment (consisting of temperatures up to 40 C (104 F) and precipitation) that would cause the loss of the capability to insulate or support its associated electrical conductor.

Regarding the potential for contamination of insulators, the applicant states that buildup of surface contamination is gradual and is washed away by rain; the glazed insulator surface aids this contamination removal. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near facilities that discharge soot or near the seacoast where salt spray is prevalent. The applicant also states that PINGP is located in an area with moderate rainfall where airborne particle concentrations are comparatively low; consequently, the rate of contamination buildup on the insulators is not significant and, at PINGP, contamination build-up on insulators is not a problem due to rainfall periodically "washing" the insulators. Additionally, the applicant states that there is no nearby heavy industry or other producers of industrial effluents, which could cause excessive contamination. There is no salt spray at PINGP as the plant is far from any ocean. Therefore, the applicant concludes that surface contamination is not an applicable aging effect for the insulators in the service conditions they are exposed to at PINGP.

Regarding mechanical wear, the applicant states that this is an aging effect for strain and suspension insulators (structural metallic portions) 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 the supporting hardware. The applicant also states that although this mechanism is possible, experience has shown that the transmission conductors do not normally swing and that when they do, due to a substantial wind, the transmission conductors do not continue to swing once the wind has subsided. Wind loading that can cause a transmission line and insulators to vibrate or sway is considered in the design and installation. The applicant further states that the loss of material due to wear concern will be conservatively managed under a structural AMP.

The applicant states that it reviewed OE to validate aging effects for switchyard insulators (electrical insulation portion). This review included corrective action documents for any documented instances of switchyard insulator aging. The applicant uncovered no instance of aging related problems with in-scope switchyard insulators due to contaminants, cracking, or cement growth.

The staff reviewed LRA Section 3.6.2.2.2 against 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 although loss of material of insulators due to mechanical wear is possible, industry OE has shown that the transmission conductors do not normally swing significantly. When they do swing as a result of a substantial wind, they do not swing very long once the wind has subsided. Wind loading that can cause a transmission line and insulators to vibrate or sway is typically considered during the design and installation. Transmission conductors within the scope of license renewal are typically short spans and the surface area exposed to wind loads are not significant. However, the applicant will conservatively manage the loss of material due to wear under Structural AMP. The staff evaluation of this program is provided in Section 3.0.3 of SER.

The staff also noted surface contamination can be a problem in areas where the greatest concentration of airborne particles such as near facilities that discharge soot or near the sea coast where salt spray is prevalent. PINGP is not located near facilities that discharge soot or near the sea coast. The rate of contamination buildup on the insulators is not significant. The buildup of surface contamination is gradual and is washed away by periodic rain; the glazed insulator surface aids this contamination removal. Based on this information, the staff determines that surface contamination is not an applicable AERM for the insulators in the service conditions they are exposed to at PINGP.

Based on the programs identified above, the staff concludes that the applicant has met the SRP-LR Section 3.6.2.2.2 criteria. For those line items that apply to LRA Section 3.6.2.2.2, the staff determines that that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion and Fatigue, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Pre-Load

In LRA Section 3.6.2.2.3, the applicant addressed loss of material due to wind-induced abrasion and fatigue, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load. The applicant states that corrosion in aluminum core steel reinforced (ACSR) conductors is a slow acting mechanism. Corrosion rates are dependent on air quality. The applicant also states that PINGP is located in an agricultural area with no nearby industries that could contribute to corrosive air quality. The applicant further states that corrosion testing of transmission conductors at Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80-year-old ACSR conductor. The Institute of Electrical and Electronic Engineers National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength. Therefore, assuming a 30% loss of strength, the applicant states margin remaining over what is required by the NESC and the existing actual conductor strength. The applicant states that in determining actual conductor tension, the NESC considers various loads imposed by ice, wind, and temperature as well as length of conductor span. The applicant states that PINGP transmission conductors in-scope for license renewal are short spans located within the PINGP site, and are designed for heavy loading; therefore, the Ontario Hydroelectric heavy loading zone study is aligned with respect to loads imposed by weather conditions.

The applicant also states that 636 kilo circular mil (MCM) ACSR transmission conductor is used in the PINGP switchyard. The ultimate strength of a 636 MCM (24/7 strands) ACSR conductor is 22,600 lbs and the maximum design tension for this conductor is 3,500 lbs. The margin between the maximum design tension and the ultimate strength is 19,100 lbs. Therefore, there is an 84.5% ultimate strength margin (19,100/22,600). The Ontario Hydroelectric study showed a 30% loss of composite conductor strength in an 80-year old conductor. The applicant states that since the margin for the PINGP conductors is greater than the margin loss due to aging, remaining safety margin exists on the aged conductors. The applicant further states that the Ontario Hydroelectric test results demonstrate that the expected material loss that would be incurred on the PINGP ACSR transmission conductors is acceptable for the period of extended operation. Therefore, no aging management is required for loss of material and loss of strength on the ACSR transmission conductors at PINGP.

In LRA Section 3.6.2.2.3, the applicant states that the switchyard bus and connections subject to an AMR (1) are constructed of aluminum and aluminum alloy (bolting), (2) are exposed to an atmosphere/weather (same as Air-Outdoor) environment consisting of temperatures up to 40 ºC (104 ºF), precipitation, and negligible radiation, (3) provide electrical connections to specific sections of an electrical circuit to deliver voltage, current or signals, and (4) require no AMP. The applicant also states that there are no aging effects from the outdoor environment (consisting of temperatures up to 40 ºC (104 ºF) and precipitation) that would cause the loss of the capability to provide electrical connections to specified sections of an electrical circuit to deliver voltage, current, or signals. The applicant further states that PINGP currently performs periodic thermography and visual inspection of switchyard connections.

The applicant states that it determined that an environment consisting of temperatures up to 40 ºC (104 ºF) and precipitation has no significant aging effect on aluminum and aluminum alloy. The applicant further states that it already maintains an existing inspection program on switchyard connections, and does not require a license renewal program; therefore, no license renewal AMP is required for high-voltage switchyard bus and connections. The applicant also states that it reviewed industry OE and NRC generic communications related to the aging of transmission conductors in order to ensure that no additional aging effects exist beyond those identified above. The applicant further states that PINGP also reviewed plant-specific OE, including nonconformance reports, licensee event reports, and CRs. PINGP's review did not identify unique aging effects for transmission conductors beyond those identified above. The applicant concludes that no license renewal AMP is required for the PINGP transmission conductors and connections aging effects of loss of conductor strength and loss of material (mechanical wear).

The staff reviewed LRA Section 3.6.2.2.3 against the criteria in 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 finds that corrosion of an ACSR conductor is a very slow acting mechanism and insignificant during the period of extended operation. The conductor strength of a 636 MCM ACSR conductor is 22,600 lbs. and the maximum design tension for this conductor is 3500 lbs. The heavy load tension is 15.5 % of the conductor strength (3500 lbs./22600 lbs.) The Ontario Hydroelectric study showed a 30% loss of conductor strength after 80 years in service for an ACSR transmission conductor. A 30% loss of conductor strength would mean the heavy load tension is 22% of the ultimate conductor strength (3500 lbs./22600 lbs. x 70%) which is within the 60% NESC requirement. This illustrates that the transmission conductor will have ample strength through the period of extended operation. Based on this information, the staff concludes that loss of conductor strength is not a significant aging effect requiring management at PINPG.

The staff noted that increased resistance of connections due to oxidation could occur in transmission conductors and connections, and in switchyard bus and connections. The applicant stated in LRA Section 3.6.2.2.3 that there are no aging effects from the outdoor environment that would cause the loss of the capacity to provide electrical connections to specified sections of an electrical circuit to deliver voltage, current, or signals. SRP-LR Section 3.6.2.2.3 recommends a plant-specific AMP for the management of increase resistance of connections due to oxidation or loss of pre-load in transmission conductors and connections and in switchyard bus and connections. The applicant did not explain why increased resistance of connections due to oxidation or loss of pre-load in transmission conductors and connections, and in switchyard bus and connections is not an AERM. By letter dated December 18, 2008, in RAI 3.6-1, the staff asked the applicant to explain why increased resistance of connections of transmission connections and switchyard bus connections due to oxidation or loss of pre-load is not identified as an AERM. In response to the staff's request, in a letter dated January 20, 2009, the applicant stated that the switchyard bus connections within the component boundaries are bolted, welded and crimped aluminum connections for cables. The PINGP OE review has not identified aging problems with the high-voltage switchyard bus and connections that resulted from loss of material, wind induced abrasion and fatigue loss of conductor strength, corrosion increased resistance of connections, oxidation or loss of pre-load. Bellville washers are also used at PINGP to minimize the effects of loose connections from loss of pre-load. Failures of Bellville washers (causing loose connections) were noted from industry OE, whereby hydrogen entrapment with plated steel washers caused embrittlement and stress cracking of the plated washer leading to loose connections. Action has been taken by the industry to correct this issue. The PINGP design includes the use of stainless steel Bellville washers. The issue of hydrogen entrapment causing failures is not an issue for stainless steel Bellville washers used at PINGP.

The applicant also stated that surface oxidation does initially occur on aluminum switchyard bus and connection portions exposed to air-outdoor environments, but the oxidation levels do not adversely impact the bus and connections from appreciable losses of material. This initial oxidation of exposed aluminum actually provides a protective layer, whereby further oxidation is progressively slowed to negligible levels. The internal contact surfaces of the switchyard bolted connections are not exposed to a moisture environment that would contribute to corrosion of the connection contact surface area. A loose connection (from any other cause, such as inadequate tightening during maintenance) is required to provide an environment for the onset of corrosion of the internal connection surfaces to occur.

The applicant further stated that for the ambient environmental conditions at the PINGP substation, no aging effects have been identified for switchyard bus and connections that could cause a loss of intended function for the extended period of operation. Therefore, the applicant believes there are no applicable or significant aging effects for the aluminum bus and aluminum alloy connections that require aging management. As a result, no plant-specific license renewal AMP is required for transmission cables and conductors, and switchyard bus and connections.

In reviewing the applicant's response to the staff request for additional information, the staff noted that the applicant did explain why increased resistance of switchyard bus connections is not an AERM. However, the applicant did not explain why increased resistance of transmission conductor connections due to oxidation or loss of pre-load is not identified as an AERM. Increased resistance of connections due to oxidation could occur in transmission connections. In a January 28, 2009 telephone conference, the staff requested the applicant to explain why PINGP transmission connections are not subject to aging effects. In response to the staff's request, in a letter dated February 6, 2009, the applicant stated that the high-voltage transmission conductors and connections are bolted, welded and crimped aluminum connections. The applicant reviewed the PINGP OE and did not identify loss of material or corrosion causing increase resistance of connection in the high-voltage switchyard bus and connections.

The staff noted that for switchyard bus and connections, and transmission conductor and connections, the connections are bolted, welded and crimped aluminum alloy. The initial oxidation of aluminum provides a protective layer and further oxidation is negligible. Therefore, there is no significant aging effect of oxidation on aluminum alloy. In addition, Bellville washers are used at PINGP to minimize the effects of loose connections from loss of pre-load. Since PINGP uses stainless steel Bellville washers, hydrogen embrittlement issue with electroplated Belleveville washers is not applicable to PINGP. Furthermore, the applicant has reviewed PINGP OE, and has not identified any aging problems with the high-voltage switchyard connections that resulted from loss of material, corrosion increased resistance of connections, oxidation or loss of pre-load. Based on this information, the staff concludes that increased resistance of connections due to oxidation or loss of pre-load in switchyard bus and connections, and transmission conductor and connections is not a significant AERM at PINGP.

Based on the programs identified above, the staff concludes that the applicant has met the 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 that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.3 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.

In some plants, 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 including brittleness, degradation, or missing tie wraps, and tie wraps failures (debris considerations) affected safety functions of other system/components (e.g., blocking the safety-related sump pumps). The PINGP LRA does not discuss tie wraps as requiring AMRs. By letter dated December 18, 2008, the staff issued RAI 3.6.2, which asked the applicant to explain why tie wraps do not require an AMR. In particular, the staff asked the applicant to address if tie wraps are credited for seismic analysis in the CLB and the effects of tie wraps (debris considerations) for 10 CFR 54.4 (a)(2) over 10 CFR 54.4 (a)(1), non safety components whose failure could affect safety-functions. The staff also asked the applicant, if tie wraps are considered in plant design specifications, provide a quantitative analysis of the cable spacing not maintained per the original design specifications (due to tie wraps failures). By letter dated January 20, 2009, the applicant responded that it has reviewed the use of tie wraps at PINGP and confirmed that tie wraps are not within the scope of license renewal and not subject to an AMR. For debris considerations, the applicant stated that it reviewed industry and PINGP OE. Foreign material debris, such as broken tie wraps, can cause equipment functional failures. PINGP equipment that is sensitive to debris, such as broken tie wraps, is designed to be protected by enclosures. The applicant further stated that maintenance-induced failures from inadequate foreign material exclusion practices involving tie wraps does not bring tie wraps in-scope and does not require AMRs for license renewal purposes. Its analysis of the containment sump for the safety-related recirculation mode of post-accident operation, considered the effects of debris, including tie wraps. The applicant did not identify any occurrences involving a nonsafety-related tie wrap failure affecting safety-related intended functions at PINGP. For seismic support considerations, the applicant stated that tie wraps are used to assist in the orderly installation of cables in trays at PINGP. Tie wraps are not credited for support in the PINGP seismic analyses. For ampacity considerations, the applicant stated that the PINGP UFSAR Section 8.7 states "Power cables are installed with only a single layer of cables per tray and clamped in the ladder to ensure that a specified spacing exists between these cables to ensure that air cooling is available."

The applicant also stated that PINGP conducted a cable insulation aging assessment for the hypothetical configuration of un-spaced single layer power cables in trays with continuous heavy current loading for motors credited to start and run during a design basis accident. For the continuous heavy current loaded power cables, the applicant based the free-air rating on Insulated Power Cable Engineered Association (IPCEA) P-46-426, Insulated Cable Power Association (ICPA) P-54-440, and the National Electric Code (NEC). For each of the continuous heavy current loaded power cables, the applicant obtained full load amps or actual amps value. The applicant applied an aging assessment screening de-rating factor of 50% to the power cables' free air allowable ampacity value. The applicant did not identify any continuous heavily loaded power cables with in-scope of license renewal to be operating at or above 50% of free air allowable ampacity. The applicant's aging assessment concluded that power cables have adequate design margin to accommodate a hypothetical not spaced configuration, 60 years of operational aging, and to start and run credited motors during a design basis accident.

The applicant further stated that following example illustrates the process used for aging assessments. A power cable to a Charging Pump Motor, 125 HP (460V), operates at 145 amps full load name plate. The (3/C 4/0 copper) cable allowable ampacity for free air is 359 amps. The 145 full load amps drawn by the motor is 40% of the free air allowable ampacity of the cable. (The free air allowable ampacity values, as well as derating criteria, reside in IPCEA P-46-426, ICPA P-54-440, and the NEC.)

In reviewing the applicant's response, the staff noted that the applicant did not address the effects of cable spacing for the motor to start. This current is typically 2 to 3 time the continuous run current. In a January 28, 2009, telephone conference; the staff asked the applicant to explain why starting current is not an issue for aging of un-spaced power cables. By letter dated February 6, 2009, the applicant responded that the starting of motors does result in a current inrush (current surge) above the motor's full load current, but this starting current surge has only a momentary duration that does not contribute to cable aging effects. Cable aging is dependent on the average temperature exposure of cable insulation over the 60-year service duration.

The staff finds the applicant's response is acceptable because tie wraps are not credited in seismic analyses and failures of tie wraps will not affect safety components to perform their intended function(s) during license renewal. Furthermore, the applicant did not identify any occurrences involving a nonsafety-related tie wrap failure affecting safety-related intended functions at PINGP. The applicant provided a quantitative analysis of the effects of cables spacing not being maintained as original design (due to tie wraps failure). This analysis demonstrated that with ampacity reduction of 50%, power cable have adequate design margin for motors to run during the design basis accident. The starting of motors has only a momentary duration that would not be affected by cable spacing because cable thermal resistance is insignificant during moments of starting current. Therefore, the staff found that tie wraps are not in-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 and Activities." On the basis of its review of the AMR results and AMPs, the staff concludes**, with the exception of OIs 3.0.3.1.21-1 and 3.0.3.2.17-1,** 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.

SECTION 4

TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section of the safety evaluation report (SER) addresses the identification of time-limited aging analyses (TLAAs). In Sections 4.2 through 4.7 of the license renewal application (LRA), Northern States Power, a Minnesota Corporation (NSPM or the applicant) addressed the TLAAs for Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2. SER Sections 4.2 through 4.8 document the review of the TLAAs by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff).

TLAAs are certain plant-specific safety analyses that involve time-limited assumptions defined by the current operating term. Pursuant to Title 10, Section 54.21(c)(1), of the Code of Federal Regulations (10 CFR 54.21(c)(1)), applicants must list TLAAs as defined in 10 CFR 54.3. In addition, pursuant to 10 CFR 54.21(c)(2), applicants must list plant-specific exemptions granted under 10 CFR 50.12 based on TLAAs. For any such exemptions, the applicant must evaluate and justify the continuation of the exemptions for the period of extended operation.

4.1.1 Summary of Technical Information in the Application

To identify the TLAAs, the applicant evaluated calculations for PINGP Units 1 and 2 against the six criteria specified in 10 CFR 54.3. The applicant indicated that it has identified the calculations that met the six criteria by searching the current licensing basis (CLB). The CLB includes the updated final safety analysis report (UFSAR), engineering calculations, technical reports, engineering work requests, licensing correspondence, and applicable vendor reports. In LRA Table 4.1-1, "Time-Limited Aging Analyses," the applicant listed the applicable TLAAs:

- reactor vessel neutron embrittlement
- metal fatigue
- environmental qualification analyses of electrical equipment
- containment and penetration fatigue analyses
- reactor coolant system piping leak-before-break analyses
- reactor vessel underclad cracking
- reactor coolant pump flywheel
- fatigue analysis of cranes
- probability of damage to safeguards equipment from turbine missiles

Pursuant to 10 CFR 54.21(c)(2), the applicant stated that it did not identify exemptions granted under 10 CFR 50.12 based on TLAAs as defined in 10 CFR 54.3.

4.1.1.1 Amendment of LRA Section 4.7.5, Probability of Damage to Safeguards Equipment from Turbine Missiles

In NSPM Letter No. L-PI-09-047, dated April 6, 2009, the applicant amended its LRA to delete the probabilistic turbine rotor failure analysis associated with LRA Section 4.7.5, “Probability of Damage to Safeguards Equipment from Turbine Missiles” (henceforth Turbine Missile Analysis), as an analysis that meets the definition of a TLAA under the TLAA identification criteria of 10 CFR 54.3. In this letter, the applicant stated that, upon reassessment of this analysis, the Turbine Missile Analysis was not a TLAA for the LRA because the time frame for the analysis was not based on time-limited assumptions defined by the current operating period. Thus, in this letter, the applicant made the following LRA changes in order to delete the Turbine Missile Analysis:

> In LRA Section 3.4.2.3 on Page 3.4-21, the last bullet, Probability of Damage to Safeguards Equipment from Turbine Missiles, is deleted in its entirety.
>
> In LRA Table 4.1-1 on Page 4.1-7, the last line item, Probability of Damage to Safeguards Equipment from Turbine Missiles, is deleted in its entirety.
>
> In LRA Section 4.7 on Page 4.7-1, the sentence is revised in its entirety to read:
>
> Other PINGP-specific TLAAs include leak-before-break (LBB) analyses, underclad cracking, RCP flywheel, and fatigue analysis of cranes.
>
> LRA Section 4.7.5 on Pages 4.7-4 through 4.7-6 is deleted in its entirety.
>
> LRA Section A4.9 on Pages A-25 and A-26 is deleted in its entirety.

In NSPM Letter No. L-PI-09-059, dated April 17, 2009, the applicant supplemented the information in the letter of April 6, 2009, in order to clarify why the Turbine Missile Analysis did not meet the Criterion (3) of 10 CFR 54.3 – the analysis must be based on based time-limited assumptions defined by the current operating period. This supplemental information is discussed and evaluated in SER Section 4.1.2.1 to support the staff’s basis for concluding that the Turbine Missile Analysis does not meet the definition of as defined by TLAA in 10 CFR 54.3.

4.1.2 Staff Evaluation

LRA Section 4.1 lists the PINGP TLAAs. The staff reviewed the information to determine whether the applicant has provided sufficient information pursuant to 10 CFR 54.21(c)(1) and 10 CFR 54.21(c)(2). As defined in 10 CFR 54.3, TLAAs meet the following six criteria:

(1) involve systems, structures, and components within the scope of license renewal, as described in 10 CFR 54.4(a)

(2) consider the effects of aging

(3) involve time-limited assumptions defined by the current operating term (40 years)

(4) are determined to be relevant by the applicant in making a safety determination

(5) involve conclusions, or provide the basis for conclusions, related to the capability of the system, structure, and component to perform its intended functions, as described in 10 CFR 54.4(b)

(6) are contained or incorporated by reference in the CLB

The applicant reviewed the list of common TLAAs in NUREG-1800, Revision 1, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (SRP-LR), dated September 2005. The applicant listed TLAAs applicable to PINGP in LRA Tables 4.1-1.

As required by 10 CFR 54.21(c)(2), the applicant must list all exemptions granted in accordance with 10 CFR 50.12, based on TLAAs, and evaluated and justified for continuation through the period of extended operation. The LRA states that each active exemption was reviewed to determine whether it was based on a TLAA. The applicant did not identify any TLAA-based exemptions. Based on the information provided by the applicant regarding the process used to identify these exemptions and its results, the staff concludes, in accordance with 10 CFR 54.21(c)(2), that there are no TLAA-based exemptions justified for continuation through period of extended operation.

4.1.2.1 Staff Evaluation of the Applicant’s LRA Amendment to Delete LRA Section 4.7.5, Probability of Damage to Safeguards Equipment from Turbine Missiles, From the Scope of the LRA

LRA Section 4.7.5, Probability of Damage to Safeguards Equipment from Turbine Missiles, provides the applicant’s original TLAA assessment for the PINGP probabilistic failure analysis for the turbine rotors and blades (henceforth Turbine Missile Analysis). The staff noted that in this section of the LRA, the applicant referred to the following documents in the CLB to support its TLAA basis under TLAA acceptance criterion in 10 CFR 54.21(c)(1)(i): (1) NUREG-0800 Chapter 3.5.3, “Barrier Design Procedures,” (2) Section UFSAR Section 12.2.7, (3) UFSAR Section 11.2.3.2, (4) UFSAR Figure 12.2-38, and (5) WCAP-11525, (6) the staff’s safety evaluation on PINGP turbine stop valve, governor valve, and intercept valves testing frequencies and safety evaluation on WCAP-11525, which were issued in license amendment 86 for Unit 1 operating license DPR-42 and license amendment 79 for Unit 2 operating license DPR-50, dated February 7, 1989.

Chapter 3.5.1.3 of the Standard Review Plan for the Review of Safety Analysis Results for Nuclear Power Plants (SRP-SAR), Revision 3, provides the NRC most recent guidance for performing probabilistic turbine missile analysis for turbine rotor and blade failure that are used to demonstrate compliance with the requirements of 10 CFR Part 50, Appendix A, “General Design Criteria” (GDC), GDC No. 4, Environmental and Dynamic Effects Design Bases, or similar design bases for plants that were licensed prior to the staff’s development of the GDC. The staff noted that, consistent with this guidance, the applicant established that the probabilistic analysis for these components is calculated in accordance with the following equation:

$$P_4 = P_1 \times P_2 \times P_3$$

Where

P_1 = the probability of turbine failure resulting in the ejection of turbine rotor (or internal structure) fragments through the turbine casing.

P_2 = the probability of ejected missiles perforating intervening barriers and striking safety-related structures, systems, or components.

P_3 = the probability of struck structures, systems, or components failing to perform their safety function

The staff noted that Chapter 3.5.1.3 of the SRP-SAR establishes that these probabilistic failure analyses must demonstrate an acceptably low risk of damage from postulated turbine missiles so long as the overall P4 probability failure remains less than 1×10^{-7}. The staff also noted that this SRP chapter establishes that the combined product of the P2 × P3 probability factors should be set in the range of 1.0×10^{-2} to 1.0×10^{-3} for unfavorably oriented turbines. The staff noted that the applicant has conservatively set the product of the P2 × P3 probability factors to a value of 1.0×10^{-2} consistent with the SRP-SAR recommendations. Thus, the staff noted that applicant's probability of failure analysis for the turbine rotors would remain valid so long as the P1 probability factor value for turbine rotor or blade ejections remains less than or equal to a value of 1.0×10^{-5}.

The staff noted that in NPSM Letter No. L-PI-09-047 (dated April 6, 2009), and as amended in NPSM Letter No. L-PI-09-059 (dated April 17, 2009), the applicant amended its LRA to delete the Turbine Missile Analysis as an analysis that meets the definition of a TLAA according to 10 CFR 54.3. The applicant's basis for deleting the Turbine Missile Analysis as a TLAA for the LRA has been summarized in SER Section 4.1.1.1.

The staff reviewed the information given in LRA Section 4.7.5, and as amended by the relevant information in the applicant's letters of April 6, 2009 and April 17, 2009, in order to determine whether the applicant had a valid basis for deleting the Turbine Missile Analysis as an analysis that meet the definition of a TLAA in 10 CFR 54.3.

The staff assessed the Turbine Missile Analysis against the six TLAA definition criteria in 10 CFR 54.3. The staff determined that the Turbine Missile Analysis meets criteria 1, 2, 4, 5, and 6 as defined below:

(1) The analysis meets Criterion (1) - the analysis must involve systems, structures, and components within the scope of license renewal - because the generation of postulated turbine missiles is relevant to the integrity of passive, long-lived safeguards equipment that are within the scope of license renewal and that are subject to an AMR.

(2) The analysis meets Criterion (2) - the analysis must consider the effects of aging - because the generation of postulated turbine missiles is initiated by a fatigue induced failure of a turbine rotor or blade.

(4) The analysis meets Criterion (4) - the analysis must be determined to be relevant by the applicant in making a safety determination - because the analysis is performed ensure the structure integrity safeguards equipment against the generation of postulated turbine missiles in order to satisfy the design requirement in 10 CFR Part 50, Appendix A,

"General Design Criteria" (GDC), under GDC No. 4, "Environmental and Dynamic Effect Design Bases.

(5) The analysis meets Criterion (5) - the analysis must 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) - because the analysis is relevant to the ability of passive-longed safeguard equipment to perform their intended 10 CFR 54.4(a)(1) safety functions during the period of extended operation.

(6) The analysis meets Criterion (6) - the analysis must be contained or incorporated by reference in the CLB - because the analysis is relevant to compliance with the design requirements for the CLB, as established in GDC No. 4.

Thus, the staff noted that whether the Turbine Missile Analysis meets the definition of a TLAA depends on whether the analysis conformed to TLAA definition Criterion (3) – the analysis must involve time-limited assumptions defined by the current operating term. Thus, the staff determined that the Turbine Missile Analysis would only meet TLAA definition Criterion (3) if the validity of the analysis was performed for a period equal to the currently licensed life of the plant or more than the time frame established at the expiration of the period of extended operation.

The applicant determined that the Turbine Missile Analysis does not meet the TLAA definition Criterion (3) for a TLAA because it stated the probabilistic analysis was used to support an approximate 10-year inservice inspection (ISI) interval for the turbine rotors and blades and a 12 month inservice testing surveillance frequency for the turbine governor valves, stop valves, and intercept valves (which are implemented in accordance with the applicant's Technical Requirements Manual (TRM)).

The staff noted that in the applicant's letter of April 17, 2009, the applicant clarified that TRM Section 3.7.3 requires the applicant to maintain the probability of a turbine rotor or blade ejection event at a probability of 1.0×10^{-5} or less. In this letter the applicant clarified that the TRM section identifies that the probabilistic turbine rotor and blade ejection analysis was done in WCAP-11525, which was approved in an NRC safety evaluation date February 7, 1989, and that the validity of the turbine rotor or blade ejection probability is to be re-verified by performing required TRM Section 3.7.3 periodic surveillance testing of the turbine stop valves, intercept valves, and governor valves at a frequency of at least once every 12 months. The applicant also clarified that, although the scope of the requirements in TRM Section 3.7.3 do not include required inservice inspections of the turbine rotors and blades, WCAP-11525 does recommend that such inservice inspections of the turbine rotors and blades be implemented at the facility. The applicant also clarified that the applicant implements inservice inspections of the turbine rotors and blades at a current frequency of once every 100,000 operating hours (i.e., at a frequency of approximately once every 11.4 years) in order to meet the recommendations in the WCAP-11525. The applicant clarified that the results of the inspections are also used to reestablish the validity of the turbine rotor and blade probability of ejection value.

The staff noted that the result of the surveillance tests of the turbine stop valves, intercept valves, and governor valves and the inservice inspections of the turbine rotors and blades is used to reestablish the validity of the Turbine Missile Analysis. Since the surveillance tests are performed at a minimum frequency of once every 12 months and the inservice inspections are performed at a minimum frequency of approximately once every 11.4 years, the staff finds that the time interval for re-establishing the validity of the Turbine Missile Analysis is based on a period that is less than the current life of the plant. Based on this review, the staff finds that the Turbine Missile Analysis does not need to be identified as a TLAA for the LRA because the probabilistic failure analysis for the PINGP turbine rotors and blades (as given in WCAP-11525) is not based on an analysis that is defined by the life of the plant. The staff verified that in the applicant's letter of April 6, 2009, the applicant made the appropriate amendments of the LRA. This include deleting LRA Section 4.7.5 and UFSAR Section A4.9 from the scope of the LRA and making appropriate changes to Sections 3.4, 4.1 and 4.7 of the application. Based on this review, the staff concludes that the applicant has provided an acceptable basis for the concluding that the Turbine Missile Analysis does not need to be identified as a TLAA for this LRA and for deleting this analysis from the scope of the LRA.

4.1.3 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable list of TLAAs, as required by 10 CFR 54.21(c)(1). The staff confirmed, as required by 10 CFR 54.21(c)(2), that no exemption to 10 CFR 50.12 had been granted based on a TLAA.

4.2 Reactor Vessel Neutron Embrittlement

Neutron embrittlement is a significant aging mechanism for all reactor pressure vessel (RPV) steels that are exposed to neutron fluence greater than 1017 n/cm2 (E>1.0 MeV). During plant operation, neutrons from the fuel in the core irradiate the RPV walls and consequently change the material properties of the RPV steel. The most pronounced changes are observed in the fracture toughness of the RPV steel. Fracture toughness is a measure of a material's resistance to crack propagation in response to stress fields. A reduction in fracture toughness of the steel due to irradiation is referred to as neutron embrittlement. As the neutron fluence level experienced by the RPV increases over time, the RPV steel fracture toughness decreases. The most significant level of neutron embrittlement typically occurs around the section of the RPV wall that is closest to the fuel assemblies and is exposed to neutron fluence greater than 1017 n/cm2 (E>1.0 MeV). This section of the RPV wall is referred to as the RPV beltline region.

Pursuant to 10 CFR 54.21(c)(1)(ii), the applicant has updated the analyses for the RPV neutron embrittlement TLAAs from the initial 40-year license to address the additional 20 years of operation (i.e., 60 years) of both PINGP, Units 1 and 2.

4.2.1 Reactor Vessel Fluence

4.2.1.1 Summary of Technical Information in the Application

LRA Section 4.2.1 summarizes the evaluation of reactor vessel fluence for the period of extend operation. The applicant stated that the fast neutron exposure parameters were determined for PINGP using the methodologies discussed in WCAP-14040-NP-A, Revision 4, "Methodology Used to Develop Cold Overpressure Mitigating Systems Setpoints and RCS Heatup and Cooldown Limit Curves" (Reference 95).

The applicant stated that the present fluence values are based on 54 effective full-power years (EFPY) of operation, incorporate the operating history of the plant, and project the implementation of a measurement uncertainty recapture power uprate. The 54 EFPY projection is expected to bound the plant operation at a capacity factor for both units of 90 percent, which the applicant stated is conservative based on operating history at both units. In 2006, the historical capacity factor for Unit 1 was 84.5 percent and for Unit 2 was 87 percent.

4.2.1.2 Staff Evaluation

The guidance provided in Regulatory Guide (RG) 1.190 indicates that the following comprises an acceptable fluence calculation:

- A fluence calculation performed using an acceptable methodology
- Analytic uncertainty analysis identifying possible sources of uncertainty
- Benchmark comparison to approved results of a test facility
- Plant-specific qualification by comparison to measured fluence values

As noted in an NRC staff safety evaluation dated February 27, 2004, (Reference 23) WCAP14040-A (Reference 95) acceptably addressed the analytic uncertainty analysis, benchmark comparisons, and extensive, generic qualification based on comparison of calculations with measurements obtained from a large number of surveillance capsules withdrawn from a variety of pressurized water reactors.

As described in Reference 95, the PINGP fluence calculations were performed using the two-dimensional discrete ordinates code, DORT (Reference 85), with the BUGLE-96 cross-section library (Reference 55), which was derived from the Evaluated Nuclear Data File (ENDF/B-VI) (Reference 84). Approximations include a P_5 Legendre expansion for anisotropic scattering and a S_{16} order of angular quadrature. These approximations are of a higher order than the P_3 expansion and S_8 quadrature suggested in RG 1.190. Space and energy dependent core power (neutron source) distributions and associated core parameters are treated on a fuel cycle specific basis. Three dimensional flux solutions are constructed using a synthesis of azimuthal, axial, and radial flux. Source distributions include cycle-dependent fuel assembly initial enrichments, burnups, and axial power distributions, which are used to develop spatial and energy dependent core source distributions that are averaged over each fuel cycle. This method accounts for source energy spectral effects by using an appropriate fission split for uranium and plutonium isotopes based on the initial enrichment and burnup history of each fuel assembly. The neutron transport calculations, as described above, are performed in a manner consistent with the guidance set forth in RG 1.190.

Reference 23 also contains an analytic uncertainty analysis that statistically combines uncertainties associated with individual components of benchmark transport calculations. The calculations were compared with the benchmark measurements from the Poolside Critical Assembly (PCA) simulator at the Oak Ridge National Laboratory (ORNL), and with surveillance capsule and reactor cavity measurements from the H.B. Robinson power reactor benchmark experiment. These constitute acceptable test facilities.

Reference 95 also requires that each subsequent application of the methodology make comparisons with plant-specific dosimetry results to demonstrate that the plant-specific transport calculations are consistent with the uncertainties derived from the methods qualification. The fluence calculations for PINGP are supported by comparison to four dosimetry capsules withdrawn from each unit (Reference 54), and hence by adherence to this aspect of the approved WCAP-14040-A method, are acceptably qualified with plant-specific dosimetry.

The applicant's fluence projections assume a 90 percent capacity factor at both units. Given the historic capacity factors listed in the application, the NRC staff agrees that the 90 percent capacity factor is conservative, such that 54 EFPY will bound the 20-year period of extended operation.

In summary, the staff finds the applicant has discussed fluence calculations performed using an acceptable methodology, supported by analytic uncertainty analysis and comparison to approved test facilities, along with a plant-specific comparison of measured fluence values from Surveillance Capsule T. Based on these considerations, the staff concludes that NSPM has followed the guidance in RG 1.190, and the neutron exposures reported in the PINGP LRA are, therefore, acceptable. The staff also concludes that, because the applicant has used actual past operating history in its fluence calculations, accounted for a power uprate, and assumed a reasonably conservative capacity factor, the fluence projections account adequately for the period of extended operation.

4.2.1.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of the reactor vessel neutron fluence in LRA Appendix A.4.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the reactor vessel neutron fluence TLAA is adequate.

4.2.1.4 Conclusion

Based on the staff's review as discussed in the above evaluation, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the reactor vessel neutron fluence analysis has been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.2 Charpy Upper-Shelf Energy

4.2.2.1 Summary of Technical Information in Application

Charpy V-notch tests indirectly estimate fracture toughness, and Charpy V-notch test results are measured in ft-lbs or joules of absorbed energy. Higher fracture toughness values directly correlate to greater absorbed energy to fracture during Charpy V-notch tests. Plots of Charpy V-notch absorbed energy vs. the test temperature produce a relationship that is described by a hyperbolic tangent function. Plots of Charpy V-notch energy vs. temperature reveal three distinct energy-temperature regions; a low temperature plateau (lower-shelf region), a region of rapidly increasing absorbed energy with temperature (transition region), and a high temperature plateau (upper-shelf region).

LRA Section 4.2.2 summarizes the evaluation of the Charpy Upper-Shelf Energy (USE) analyses for the period of extended operation. The applicant provided its USE assessments for the RPV beltline materials of PINGP, Units 1 and 2 in LRA Tables 4.2-2 and 4.2-3, respectively. The applicant implemented the positions of RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," to obtain the end of license (EOL) USE values for PINGP, Units 1 and 2. Footnotes were provided by the applicant for Tables 4.2-2 and 4.2-3 to clarify which RG

1.99, Rev. 2 position was used to determine the predicted percent drop in USE at EOL. The applicant determined that all beltline materials exhibited USE of greater than 50 ft-lb (68 joules) through the end of the extended period of 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 USE TLAA has been projected to the end of the period of extended operation.

Appendix G to 10 CFR Part 50 requires that RPV beltline materials have USE values in the transverse direction for the base metal and along the weld for the weld material of no less than 75 ft-lb (102 joules) initially, and must maintain USE values throughout the life of the vessel of no less than 50 ft-lb (68 joules). However, in accordance with paragraph IV.A.1.a of 10 CFR Part 50 Appendix G, USE values below these criteria may be acceptable if it is demonstrated, in a manner approved by the Director, Office of Nuclear Reactor Regulation, that the lower values of USE will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the American Society of Mechanical Engineers Code (ASME Code).

RG 1.99, Rev. 2 provides an expanded discussion regarding the calculations of USE values and describes two methods (positions 1.2 and 2.2) for determining USE values for RPV beltline materials. Position 1.2 is to be used for the calculation of USE if credible surveillance data from the RPV in question is not available. Position 2.2 is to be used in the calculation of USE if there are two or more credible surveillance data sets available for the RPV in question. Since the analyses performed in accordance with Appendix G to 10 CFR Part 50 are based on a flaw with a depth equal to one-quarter of the vessel wall thickness (1/4T), the neutron fluence used in the USE analyses is the neutron fluence at the 1/4T depth location.

The applicant provided its USE assessments for the RPV beltline materials of PINGP, Units 1 and 2, in LRA Tables 4.2-2 and 4.2-3, respectively. The USE assessments were based on the 1/4T neutron fluence values listed in LRA Tables 4.2-2 and 4.2-3. These neutron fluence values are based on the projected values at the end of the extended period of operation (i.e., at 54 EFPY, where the 54 EFPY was calculated by assuming a conservative 0.9 capacity factor applied over 60 calendar years of operation. The applicant correctly used the guidance in RG 1.99, Rev. 2, positions 1.2 and 2.2 to determine the predicted percentage decrease in USE. The percentage decrease in USE was applied to the initial USE values listed in Tables 4.2-2 and 4.2-3 to arrive at the predicted EOL USE values for all the beltline materials. The most limiting beltline material was determined to be the Circumferential Weld-Nozzle Shell Forging B- to-Intermediate Shell Forging C, for both Units 1 and 2. The applicant determined this limiting beltline material to have a predicted EOL USE of 59 and 57 ft-lb for PINGP, Units 1 and 2, respectively. The staff was unclear as to whether this particular limiting beltline identification referred to the circumferential weld between shell forgings B and C or the circumferential weld around a small line nozzle penetration in shell forging B. Therefore, the staff issued RAI 4.2.2 in a letter dated November 4, 2008, requesting the applicant to confirm this detail regarding the circumferential weld-nozzle shell forging B-to-intermediate shell forging C beltline material. The applicant submitted a response to RAI 4.2.2 in a letter dated November 12, 2008. Based on the response, the staff confirmed that circumferential weld-nozzle shell forging B-to-intermediate shell forging C is indeed a circumferential weld between shell forging B and shell forging C and that there is no small line nozzle penetration in the beltline region of the RPV.

The staff confirmed the appropriateness of the initial USE values listed in Tables 4.2-2 and 4.2-3 by comparison to the applicant's previous response to Generic Letter (GL) 92-01, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)." The staff also independently verified the reduction in the USE values resulting from neutron irradiation using the methodology prescribed in RG 1.99, Rev. 2 and finds that all the beltline materials listed in Tables 4.2-2 and 4.2-3 meet the EOL USE requirements of 10 CFR Part 50, Appendix G.

Based on the technical assessments stated above, the staff determined that the RPVs at PINGP, Units 1 and 2, will maintain an acceptable level of USE throughout the expiration of the period of extended operation. The staff therefore concludes that the applicant's TLAA for USE, as given in Section 4.2.2 of the LRA, is in compliance with requirements of 10 CFR Part 50, Appendix G and, therefore, is acceptable.

4.2.2.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of the RPV USE in LRA Appendix A.4.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the RPV USE TLAA is adequate.

4.2.2.4 Conclusion

Based on the staff's review as discussed in the above evaluation, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the RPV USE TLAA has been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Pressurized Thermal Shock

4.2.3.1 Summary of Technical Information in Application

The applicant performed a pressurized thermal shock (PTS) TLAA for PINGP, Units 1 and 2, using the criteria of 10 CFR 50.61. PTS reference temperature (RT_{PTS}) values were calculated for the inside surface of the beltline region materials for both unit's RPV using Charpy-based evaluations in accordance with the methods of 10 CFR 50.61 for a 54 EFPY operating period. The fluence values at 54 EFPY for PINGP, Units 1 and 2, were obtained using the method described in Section 4.2.1 of the LRA. The applicant states that the methodology used to calculate RPV vessel fluence meets the uncertainty requirements of Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." LRA Section 4.2.3 summarizes the results of this PTS TLAA for PINGP, Units 1 and 2 in Tables 4.2-4 and 4.2-5, respectively. The RT_{PTS} values for all the beltline materials of the PINGP, Unit 1 and 2 RPVs, at the end of the extended period of operation (54 EFPY) were calculated by the applicant to be lower than the applicable screening criteria values established in 10 CFR 50.61 and were, therefore, acceptable.

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 PTS TLAA has been projected to the end of the period of extended operation.

10 CFR Part 50.61 provides the fracture toughness requirements for protecting the RPV of pressurized water reactors against the consequences of PTS events. The rule requires each licensee to calculate the EOL RT_{PTS} value for each material located within the beltline of the RPV. The RT_{PTS} value for each beltline material is the sum of the unirradiated nil ductility reference temperature (RT_{NDT}) value, a shift in the RT_{NDT} value of the material caused by exposure to neutron irradiation (i.e., Δ RT_{NDT} value), and an additional margin term (M value) to account for uncertainties in the values of initial RT_{NDT}, copper and nickel contents, neutron fluence, and calculation procedures. 10 CFR 50.61 also provides screening criteria against which the calculated RT_{PTS} values are to be evaluated. RPV beltline base metal materials (forging or plate materials) and longitudinal (axial) weld materials are considered to be adequately protected against PTS events if the calculated EOL RT_{PTS} values are less than 270°F. RPV beltline circumferential weld materials are considered to be adequately protected against PTS events if the calculated EOL RT_{PTS} values are less than 300 °F. 10 CFR 50.61 provides a detailed quantitative discussion regarding the calculations of the shift in the RT_{NDT} value caused by exposure to neutron irradiation and the margin term to account for uncertainties. According to 10 CFR 50.61, the shift in the RT_{NDT} value caused by exposure to neutron irradiation is the product of a chemistry factor (CF) and a fluence factor. The fluence factor is dependent upon the neutron fluence, which in the evaluation of PTS is taken as the EOL fluence. The CF may be determined from surveillance material or from the tables in 10 CFR 50.61. If the RPV beltline material is not represented by surveillance material for which there is "credible" surveillance data (in accordance with 10 CFR 50.61(c)(2)(i), the CF and the shift in the RT_{NDT} value caused by irradiation may be determined using the corresponding tables of 10 CFR 50.61. The CFs determined from the tables in 10 CFR 50.61 depend upon the amount of copper and nickel in the beltline materials. If the RPV beltline material is represented by surveillance material with "credible" surveillance data (in accordance with 10 CFR 50.61(c)(2)(i)), its CF must be determined from the surveillance data using equation 5 as described in 10 CFR 50.61.

LRA Section 4.2.3 summarizes the results of this PTS TLAA. According to Tables 4.2-4 and 4.2-5 of LRA Section 4.2.3, the RT_{PTS} values for all the RPV beltline materials of PINGP, Units 1 and 2, at the end of the extended period of operation (54 EFPY) were calculated by the applicant to be lower than the applicable screening criteria values established in 10 CFR 50.61. The limiting beltline material for PINGP, Unit 1 is the circumferential weld-nozzle shell forging B-to- intermediate shell forging C, with an EOL RT_{PTS} of 157 ºF calculated using the CF tables from 10 CFR 50.61. The limiting beltline material for PINGP, Unit 2 is the circumferential weld-nozzle shell forging B-to-intermediate shell forging C, with an EOL RT_{PTS} of 136 ºF calculated using equation 5 of 10 CFR 50.61.

The staff performed independent calculations to verify the validity of the applicant's calculations of the EOL RT_{PTS} for all beltline materials using the methodology prescribed in 10 CFR 50.61. During the staff's calculation of the EOL RT_{PTS} values, a discrepancy between the initial RT_{NDT} value reported in Table 4.2-5 of the LRA for PINGP, Unit 2 lower shell forging D (22642) and the corresponding value listed in Reactor Vessel Integrity Database (RVID) was identified. The initial RT_{NDT} value reported in Table 4.2-5 of the LRA was -4 ºF for PINGP, Unit 2 lower shell forging D (22642) and the corresponding value in RVID is listed as 2 ºF . Therefore, the staff issued RAI 4.2.3.2 in a letter dated November 4, 2008, requesting the applicant to provide information which documents where the value of -4 ºF comes from and demonstrate that it is applicable to this forging. In a letter to the NRC dated November 12, 2008, the applicant referenced documents that state -4 ºF is the initial RT_{NDT}. The applicant stated that the initial $RT_{NDT\ (u)}$ of -4 ºF for PINGP, Unit 2 lower shell forging D (22642) is consistent with the $RT_{NDT\ (u)}$ value used in the current "PINGP Units 1 and 2 Pressure and Temperature Limits Report," Revision 3 (effective until 35 EFPY) and reported in WCAP-14637, "Prairie Island Unit 2 Heatup and Cooldown Limit Curves for Normal Operation," Revision 3, December 1999 (ML023230354 and ML003703560, respectively).

Furthermore, the applicant stated that the initial $RT_{NDT\ (u)}$ of -4 ºF for PINGP, Unit 2 lower shell forging D (22642) is obtained from the PINGP UFSAR, Table 4.7-9 which references, as a data source, Structural Integrity Report SIR-99-075, Revision 2, "Update of the Response to Generic Letter 92-01 Reactor Vessel Structural Integrity for Prairie Island Units 1 and 2," November 1999 (ML993410414). This report was previously transmitted from the applicant to the NRC via letter entitled "Comprehensive Revised Response to Generic Letter 92-01," dated November 10, 1999 (ML993330371). The initial $RT_{NDT\ (u)}$ of -4 ºF for lower shell forging D (22642) is documented as a change on page viii, Table 2-4 and Table 2-5 of SIR-99-075, Revision 2. Section 7.0 of SIR-99-075 provided a summary of the PINGP information in the RVID, and proposed a number of revisions to the database. Table 7-3 (page 7-4) of SIR-99-075 proposed changes to include a correction in $RT_{NDT\ (u)}$ from 2 ºF to -4 ºF for lower shell forging D (22642). Based on the information provided by the applicant as described above, the staff finds the use of -4 ºF applicable as the $RT_{NDT\ (u)}$ for PINGP, Unit 2 lower shell forging D (22642) acceptable. The staff also notes that RVID should be updated to reflect the correct $RT_{NDT\ (u)}$ value of -4 ºF for PINGP, Unit 2 lower shell forging D (22642).

The staff's independently calculated EOL RT_{PTS} values are in agreement with the applicant's values presented in Tables 4.2-4 and 4.2-5 of LRA Section 4.2.3. The staff concurs that all RPV beltline materials for both PINGP, Units 1 and 2 have EOL RT_{PTS} values that are below the threshold criterion specified in 10 CFR 50.61. Therefore, the staff finds the EOL RT_{PTS} values for all the RPV beltline materials of PINGP, Units 1 and 2 to be acceptable.

Based on the technical assessments stated above, the staff determined that the RPVs at PINGP, Units 1 and 2 will maintain acceptable RT_{PTS} values for all beltline materials throughout the extended period of operation. The staff therefore concludes that the applicant's TLAA for RPV PTS, as given in Section 4.2.3 of the LRA is in compliance with requirements of 10 CFR 50.61 and, therefore, is acceptable.

4.2.3.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of the RPV PTS in LRA Appendix A.4.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the RPV PTS TLAA is adequate.

4.2.3.4 Conclusion

Based on the staff's review as discussed in the above evaluation, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the RPV PTS TLAA has been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Pressure-Temperature Limits and Low Temperature Overpressure Protection Analyses

4.2.4.1 Summary of Technical Information in Application

Section 4.2.4 of the LRA addresses the Pressure-Temperature (P-T) limit curves and the Low Temperature Overpressure Protection System (OPPS) TLAAs. P-T limit curves are generated to satisfy the requirements of 10 CFR Part 50, Appendix G. 10 CFR Part 50, Appendix G requires RPV thermal limit analyses to determine operating P-T limits for boltup, hydrotest, pressure tests, and normal operating and anticipated operational occurrences. From these thermal limit analyses, P-T limit curves are developed for the RPV flange region and the core beltline region. Irradiation embrittlement effects are included in the development of the P-T limit curves. The effects of embrittlement on the P-T limit curves are determined using the Adjusted Reference Temperature (ART) of the RPV core beltline materials. The value of the ART for a particular material is a function of RPV 1/4T fluence, 3/4T fluence, and the beltline material chemistry and is calculated using the methodology of RG 1.99, Rev 2.

The PINGP Pressure and Temperature Limit Report (PTLR), Revision 3, contains P-T limit curves for PINGP, Units 1 and 2. These P-T limit curves were determined following the methods prescribed in the American Society of Mechanical Engineers (ASME) Code, Section XI, Appendix G, 1992 Edition. The applicant referenced the staff SER dated April 29, 1998, of the PINGP 35 EFPY PTLR as justification for the validity of the current PINGP, Units 1 and 2, P-T limits. The applicant states that the P-T limit curves will continue to be updated, as required by 10 CFR Part 50, Appendix G, or as operational needs dictate. These required updates of the P-T limit curves will be adequately managed for the period of extended operation by the Reactor Vessel Surveillance Program and this updating will assure that the operational limits remain valid through the period of extended operation. In addition, the applicant has estimated that there will be sufficient operating margin to conduct plant heatups and cooldowns at 60 years based on a comparison of 54 EFPY and 35 EFPY ART values for limiting RPV beltline materials at 1/4T below the vessel clad/base metal interface.

Each time the P-T limit curves are revised, the OPPS limits must be re-evaluated to ensure its functional requirements continue to be met. The applicant has established an OPPS enable temperature using the NRC-approved methodology presented in topical report WCAP-14040-NP-A, Revision 2, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCD Heatup and Cooldown Limit Curves," with the provision permitted by ASME Code Case N-514. Calculation of new OPPS limits is considered part of the development of P-T limit curves, therefore the OPPS limits, will be adequately managed for the period of extended operation by the Reactor Vessel Surveillance Program.

4.2.4.2 Staff Evaluation

The staff reviewed LRA Section 4.2.4 to verify, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis has been projected to the end of the period of extended operation.

10 CFR 50.60 provides acceptance criteria for fracture prevention measures for light water nuclear power reactors for normal operation by invoking the application of Appendices G and H of 10 CFR Part 50. Appendix G of 10 CFR Part 50 provides the P-T limit requirements and references ASME Code, Section XI, Appendix G as the methodology adopted to obtain minimum acceptable values for P-T limits. Calculated P-T limits for a given RPV must be at least as conservative as the limits obtained by following the methods of analysis and margins of safety of Appendix G of Section XI of the ASME Code. RPV P-T limits and minimum temperature requirements in accordance with 10 CFR Part 50, Appendix G are defined by operating condition, vessel pressure, presence of fuel in the vessel, and core criticality. The minimum temperature requirements pertain to the limiting material, which is the material in either the closure flange or the beltline region with the highest ART.

Calculation of ART values for the RPV beltline materials is accomplished by following the guidance in RG 1.99, Rev 2. The calculated ART value is the sum of the initial RT_{NDT}, predicted radiation-induced Δ $RT_{NDT,}$ and a margin term to account for uncertainties in the values of initial RT_{NDT}, copper and nickel contents, fluence, and the calculation procedures. The evaluation for the ART values are performed at the 1/4T and 3/4T wall locations of each beltline material using the neutron values at the 1/4 T and 3/4 T wall locations along respectively, with CFs determined from Tables 1 and 2 in RG 1.99, Revision 2. The applicant did not provide ART values for all beltline materials in their LRA. Therefore, the staff issued RAI 4.2.4 in a letter November 4, 2008, which requested the applicant to provide ART values for all the RPV beltline materials for PINGP, Units 1 and 2.

In letter dated November 12, 2008, the applicant submitted to the NRC the ART values of all the beltline materials as requested in RAI 4.2.4. The ART values were calculated using the methodology prescribed in RG 1.99, Rev 2. These results show that the RPV limiting beltline material is the circumferential weld–nozzle shell forging B-to-intermediate shell forging C for PINGP, Unit 1 and circumferential weld–nozzle shell forging B-to-intermediate shell forging C for PINGP, Unit 2. The staff verified the calculated ART values submitted by the applicant and confirmed the appropriateness of these calculated values. The staff also compared the calculated 54 EFPY ART values for the above RPV limiting materials for PINGP, Unit 1 and 2, respectively, to the corresponding PINGP PTLR 35 EFPY ART values. Based on this comparison, the staff finds the applicant’s estimation that there will be sufficient margin to conduct plant heatups and cooldowns through the extended period of operation to be acceptable. In addition, the applicant states that the P-T limit curves for PINGP, Units 1 and 2 will continue to be updated, as required by Appendix G of 10 CFR Part 50 or as operational needs dictate. Also, these required updates of the P-T limit curves will be adequately managed for the period of extended operation, by the Reactor Vessel Surveillance Program, consistent with 10 CFR 54.21 (c)(1)(iii).

With each revision of the P-T limit curves, the OPPS limits must also be re-evaluated because calculation of new OPPS limits are considered part of the development of the P-T limit curves. The applicant has determined that the PINGP, Unit 1 and 2 OPPS enable temperatures using the NRC-approved methodology presented in topical report WCAP-14040-NP-A, Rev. 2 with the provision permitted by ASME Code Case N-514. ASME Code Case N-514 allows for the OPPS system to limit the maximum pressure in the RPV to 110 percent of the pressure as determined from the P-T limit curve using the methodology described in ASME Code, Section XI, Appendix G. The applicant stated that the OPPS limits will be concurrently updated with the P-T limits update for PINGP, Units 1 and 2. In addition, the OPPS limits will be managed by the Reactor Vessel Surveillance Program for the extended period of operation. The staff finds the applicant's analysis and management of OPPS limits through the period of extended operation using the staff-approved methodology in WCAP-14040-NP-A, Rev. 2 to be acceptable and consistent with the requirements of 10 CFR 54.21(c)(1)(iii).

4.2.4.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of the RPV P-T limits and OPPS limits in LRA Appendix A2.34. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the RPV P-T limits and OPPS limits TLAA is adequate.

4.2.4.4 Conclusion

Based on the staff's review as discussed in the above evaluation, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the RPV P-T limits and OPPS limits TLAA will be adequately managed through the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

The staff notes that fatigue may cause a metal component that is subjected to cyclic loads to fail at load levels lower than its design load carrying capacity. Fatigue failure involves crack initiation and propagation. The fatigue life of a structural component depends on the material used for the structure, the environment to which the structural component is exposed, the number of applied loads occurrences, and magnitude of the applied fluctuating loads.

Fatigue analyses are TLAAs if they meet all six elements of the definition in 10 CFR 54.3(a). If the analyses are based on a number of cycles estimated for the current license term, they may be considered to meet criterion 54.3(a)(3) of being based on the current operating term. The staff evaluates the TLAA, per 10 CFR 54.21(c)(1), to determine whether:

- The analyses remain valid for the period of extended operation;
- The analyses have been projected to the end of the period of extend operation; or
- The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

LRA Section 4.3 states that PINGP Class 1 and non-Class 1 components that are potentially susceptible to fatigue damage have been reviewed for TLAAs and evaluated where applicable. The applicant indicates that the PINGP Class 1 boundary includes the components within the ASME Code Section XI, Subsection IWB inspection boundary as well as the steam generator items designed to ASME Code Section III, Class A or Class 1. The LRA also states that the design transients and fatigue analysis results were reviewed to assess the impact of the measurement uncertainty capture power uprate (MUR-PU) project, which has been planned, and concluded that impact due to the MUR-PU would be negligible.

The applicant states that when a flaw is detected during inservice inspections, either the flaw must be repaired or the component that contains the flaw can be evaluated for continued service in accordance with ASME Code Section XI. The applicant further states that the fracture mechanics analyses of the detected flaws may be TLAAs if the analyses are based on time-limited assumptions defined by the current operating term.

4.3.1 Class 1 Fatigue

LRA Section 4.3.1 indicates that the PINGP Class 1 boundary includes components within the ASME Code Section XI, Subsection IWB inspection boundary and the steam generator items. Specifically, these include the reactor vessels, control rod drive mechanism housings, pressurizers, and steam generators. The applicant indicates that the Class 1 non-piping components are designed in accordance with ASME Code Section III, whereas the Class 1 piping components are designed based on American Standards Association (ASA) B31.1 for Unit 1 and United States of America Standards (USAS) B31.1.0 for Unit 2 in the original design. However, the LRA states that subassemblies of pipes were later replaced and redesigned to ASME III Subsection NC because their nominal pipe size (NPS) is less than one inch.

LRA Section 4.3.1 consists of seven subsections, six of which are organized according to the type and functionality of the structural components and the seventh is used for discussing the design transients and 60-year cycle projections. This section does not consider the effects of the reactor water environment, which are addressed in Section 4.3.3.

4.3.1.1 Transient Cycles

4.3.1.1.1 Summary of Technical Information in the Application

Portions of LRA Section 4.3.1 (first four pages of LRA Section 4.3.1) discusses the transients that were used for the design analyses. The applicant indicates that the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program monitors and tracks the transients during the plant operation, performs analysis, and tracks the cycles accrued for each transient type. The applicant indicates that PINGP documents the results of the transient monitoring for both units. LRA Table 4.3-1 shows the cycles accrued through September 30, 2006. LRA Table 4.3-1 indicates that by September 30, 2006, Unit 1 logged 33 years of operation and Unit 2 logged 32 years. LRA Table 4.3-1 shows that for each transient type, the larger of the cycles accrued from the two units and the reported cycles are conservatively credited for 30 years of operation instead of 32. Therefore, for each transient, the projected 60-year cycles are exactly two times the cycles under the column labeled “Actual Number of Occurrences through 9/30/2006 (Maximum of Units 1 or 2)” of LRA Table 4.3-1.

The applicant argues that the cycle projection method used is valid because the monitoring logging record indicates a higher frequency of occurrence for the first 10 to 15 years of operation than for the most recent 10 to 15 years, and because PINGP has aging management programs (AMPs) which will ensure that both plants operate at the transient rates experienced over the most recent 10-15 years of operation.

Based on the results shown in LRA Table 4.3-1, the applicant concludes that the original number of design transient cycles will remain valid through the period of the extended operation in accordance with 10 CFR 54.21(c)(1)(i). The applicant also states that the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program will continue to assure that the accumulated numbers and severity of transients experienced by PINGP remain within design limits in accordance 10 CFR 54.21(c)(1)(iii).

4.3.1.1.2 Staff Evaluation

The staff reviewed the first four pages of LRA Section 4.3.1 to verify that the original 40-year design transient cycles will remain valid for the period of extended operation.

The staff reviewed the transients shown in LRA Table 4.3-1 and verified that they are the same as those shown in the PINGP UFSAR Table 4.1-8. During the audit, the staff reviewed the transient cycle monitoring records and confirmed that the monitoring procedures were appropriate. The staff determined that the applicant took a conservative approach by crediting only 30 years of operation for the records instead of the 32 years that were actually covered. Therefore, the staff found the applicant's conclusion that the original number of design transient cycles will remain valid through the period of extended operation acceptable. The staff also reviewed Metal Fatigue of Reactor Coolant Pressure Boundary Program, which is used to monitor and tracks the transients.

The staff notes that Metal Fatigue of Reactor Coolant Pressure Boundary Program has two objectives: (1) to characterize and validate the thermal events captured; and (2) to log and count the occurrences (cycles) for each well-defined thermal event. While the applicant has achieved the second objective and used it to demonstrate that the projected 60-year cycles would remain bounded within the design transient cycles, the first objective has not been discussed. With this concern, the staff issued RAI 4.3.1-1, in a letter dated February 20, 2009. The staff asked the applicant to:

(a) Describe the procedures that PINGP has been using for tracking thermal activities so the staff can confirm that the PINGP aging management program will ensure that P-T characteristics, including their values, ranges, and rates remain bounded within the range defined in the design specifications during the renewed license term.

(b) Provide a histogram (cycle accumulating charts) of heatup transient tracking history, and a histogram for the cooldown transient as well.

In its response to RAI 4.3.1-1, dated February 26, 2009, the applicant states that the number of occurrences of design cycles is tracked by the Metal Fatigue of Reactor Coolant Pressure Boundary Program as described in Section B3.2 of the PINGP LRA and that PINGP Technical Specifications Section 5.5.5 contains the requirement to track the transient cycles to ensure that components are maintained within the design limits.

The applicant states that this requirement is implemented by a PINGP surveillance procedure, which requires that applicable thermal and pressure transients records be kept and these records are maintained as on-going transient summary sheets contained in the procedure itself.

The applicant also states that the PINGP surveillance procedure lists the UFSAR Section 4.1.4 design pressure and temperature transients, and contains a summary sheet for each design transient that lists every cycle counted for that transient. The applicant further states that at least once each quarter, the program owner conducts a review of plant operating records to determine if an "operating cycle" has occurred for any of the design pressure or temperature transients. If a cycle has occurred, the program owner adds the event to the proper cycle summary sheet along with a brief description of the transient cycle.

The applicant states that the majority of transient cycles logged to date have been associated with heatup, cooldown and reactor trip events. The applicant also states that based on its review of the past plant, data revealed that the average plant heatup temperature rate and the average plant cooldown temperature rate were approximately 40 ^{o}F/hr and 70 ^{o}F/hr, respectively. Therefore, the applicant indicates that the heatup/cooldown temperature rates experienced by the PINGP components are bounded by the temperature rates indicated in the design specifications, 100 ^{o}F/hr.

As for the reactor trip events, the applicant states that approximately 65 percent of the reported reactor trip events in both units have occurred from an initial power level between 75 percent and 100 percent power. The remaining 35 percent of reactor trip events occurred from an initial power level lower than 75 percent of full power. For design purposes, the reactor trip transient is based on a trip from 100 percent power conditions. Therefore, the applicant states that the actual plant reactor trip events are bounded by the design transient.

The applicant further states that if a design limit for the number or severity of a transient were exceeded (e.g., RCS temperature change exceeds 100 ^{o}F/hr during heatup or cooldown), a Corrective Action Program (CAP) would be initiated, and the procedure requires that an analysis be performed to determine the effect on system components. The applicant indicates that the CAP would determine appropriate actions, potentially including reanalysis, repair, or replacement of the affected components, and assessment of additional pressure boundary locations that may be affected.

The applicant also states that since the surveillance procedure does not explicitly state that action should be initiated before a design limit is exceeded (see LRA Section B3.2 under the enhancement provision), the Metal Fatigue of Reactor Coolant Pressure Boundary Program acceptance criteria will be revised to clarify that corrective action is to be taken before any monitored location exceeds either a cumulative fatigue usage factor of 1.0 or a design basis transient cycle limit.

Based on its review, the staff finds the applicant's response to part (a) of RAI 4.3.1-1 acceptable for the following reasons:

(1) PINGP has developed the Metal Fatigue of Reactor Coolant Pressure Boundary Program (as described in Section B3.2 of the LRA) to track the number of occurrences of design cycles.

(2) PINGP has developed Technical Specifications and a surveillance procedure to ensure that components are maintained within the design limits.

(3) PINGP has acquired records of major thermal events such as heatup, cooldown and reactor trip transients confirming that the P-T values experienced by the PINGP structural components are bounded by those of the design transients.

(4) PINGP has developed a CAP which initiates and determines appropriate actions to be taken if abnormal situations should occur.

(5) The operational procedures that PINGP adopts for the transient events tracking are consistent with the GALL Report and conservative to ensure a valid cycle-based fatigue management program.

Therefore, the staff's concern described in part (a) of RAI 4.3.1-1 is resolved. Part (b) of RAI 4.3.1-1 requested the applicant to provide the histograms of the PINGP heatup and cooldown transients. The applicant provided the histograms for these two transients, as shown in the following pages.

The staff reviewed these histograms and found that the transientoccurrence rates (both heatup and cooldown) are quite constant for Unit 1 since 1980 and for Unit 2 since 1983. This means that for the past 25 years, the PINGP (Units 1 and 2) plant operation has been quite steady. The applicant made its cycle projections based on the slope of a straight line connecting the time of the plant startup (1973 for Unit 1 and 1974 for Unit 2) and the last data point, 2008. It is clear from Figures 4.3-1 and 4.3-2, that the slope used by the applicant for making cycle projections is significantly greater than that of the average of the past 25 years. As expected, the slopes of event occurrence (i.e., the rates) during the first few years (5 to 7 years) are higher than the averages for both heatups and cooldowns. This means that the basis of projections that the applicant used is conservative and therefore, the staff found it to be acceptable.

Based on its review, the staff's concern on the transient event monitoring is resolved because the applicant provided the information requested and the information validates the PINGP fatigue management program and the applicant's assumption for the number and severity of transients.

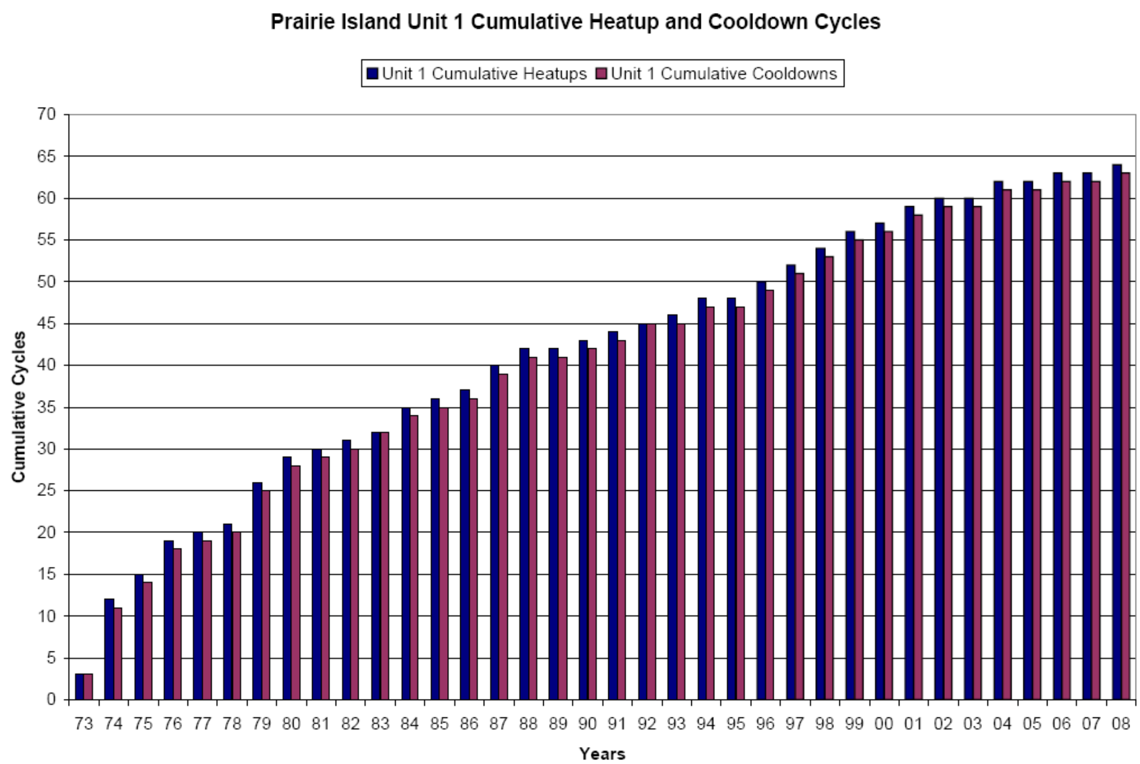

Figure 4.3-1

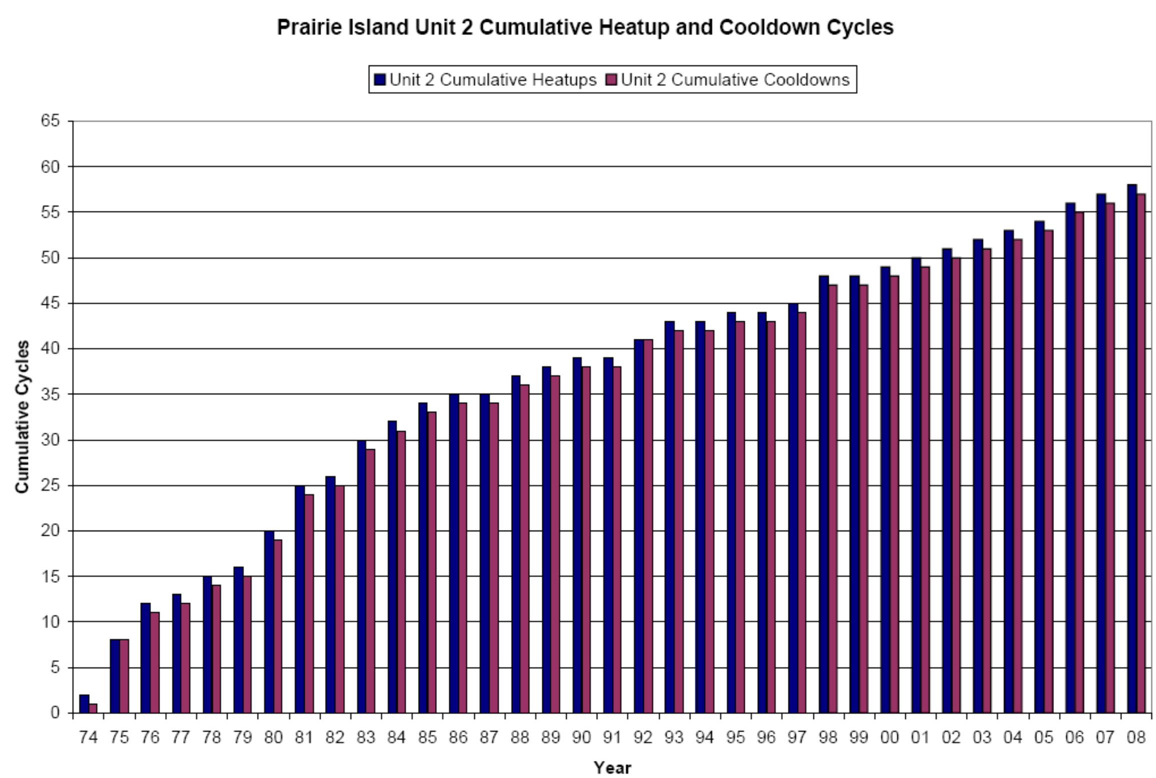

Figure 4.3-2

4.3.1.1.3 UFSAR Supplement

LRA Section A4.2 summarizes the design transients data and 60-year transient cycle projections. On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for Class 1 components is adequate.

4.3.1.1.4 Conclusion

Based on its review of the LRA, the staff concluded that the applicant has demonstrated that the original design cycles remains bounding.

The staff concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the Metal Fatigue of Reactor Coolant Pressure Boundary Program and TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.2 Reactor Pressure Vessel and CRDM Housings

4.3.1.2.1 Summary of Technical Information in the Application

LRA Section 4.3.1.1 discusses the fatigue evaluation for the RPV and control rod drive mechanism (CRDM) housing of Units 1 and 2. The applicant indicates that the fatigue usage calculations supporting the original license were based on ASME Boiler and Pressure Vessel Code, Section III, 1968 edition. The applicant also indicates that the PINGP RPV heads, including the CRDMs, at Units 1 and 2 were replaced in 2006 and 2005, respectively, and the new RPV heads were re-evaluated based on the ASME Code Section III, NB-3200 guidelines, 1998 Edition. The applicant reports the CUF values at the limiting locations of the RPV and CRDM housings in LRA Tables 4.3-2 and 4.3-3, respectively.

The applicant indicates that these usage factor calculations are considered TLAAs because they are based on the design transients intended to represent 40 years of operation. The applicant also indicates that since the number of design transients cycles used in this fatigue analysis will not be exceeded in 60 years of operation, this TLAA will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). The applicant also indicates that the cumulative numbers of design transients experienced by the CRDM housings will continue to be managed by the by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.1, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analysis remains valid for the period of extended operation.

Based on its review, the staff found the applicant's disposition of the RPV and CRDM housing TLAAs, pursuant to 10 CFR 54.21(c)(1)(i), acceptable because the projected 60-year cycles are less than the 40-year design cycles, which were used in the plant design.

It should be noted that, the applicant's claim and conclusion shown herein do not reflect environmental effects on fatigue. NUREG/CR-6260 evaluated certain components of different vintage reactor designs for their fatigue effects due to reactor water environment. According to NUREG/CR-6260, the corresponding components for PINGP (being an older vintage Westinghouse plant) are the reactor vessel inlet and outlet nozzles, and the RV Lower Head to Shell locations (three components), which are covered in LRA 4.3.1.1. The staff notes that environmental effects on fatigue for these three components and the remainder of the NUREG/CR-6260 applicable to PINGP are evaluated in LRA Section 4.3.3.

During the audit, the staff noticed that there are many places in the PINGP license renewal aging management program basis document that indicate that the applicant has used FatiguePro to perform stress-based fatigue monitoring. The phrase “stress-based fatigue monitoring” also appears multiple times in the LRA. The staff notes that FatiguePro is not endorsed by NRC staff, since it does not produce all six individual components of a transient stress tensor (Sxx, Syy, Szz, Sxy, Syz, Szx) needed to support the ASME Code Section III fatigue analysis method. FatiguePro produces only one stress component and uses that single stress component to perform fatigue evaluations.

Therefore, the staff issued RAI 4.3.1.1-1 in a letter dated December 10, 2008. The staff requested the applicant to identify any items, from LRA Tables 4.3-2 through 4.3-8, whose CUF values were calculated without using all six components of the transient stress tensors and re-evaluate those components using all six individual stress components in accordance with the ASME Code Section III guidelines. This is so that the fatigue results are valid and applicable to the period of extended operation.

In its response to RAI 4.3.1.1-1, dated January 9, 2009, the applicant states that the CUFs reported in LRA Tables 4.3-2 through 4.3-7 are all calculated in accordance with ASME Code Section III using the values of six stress components versus time for the complete stress cycle, taking into account both the gross and local structural discontinuities, as well as the thermal effects which vary during the cycle.

The applicant states that the calculations of Environmentally-Assisted Fatigue in Table 4.3-8 are based on ASME Code Section III CUFs with the exception of the pressurizer surge line hot leg nozzle safe end and the charging system nozzle for both Unit. The applicant also states that the unadjusted CUFs at both of these locations are based on FatiguePro stress-based fatigue analyses and that NSPM is in the process of performing ASME Code (Subsection NB) compliant fatigue calculations for the pressurizer surge line hot leg nozzle and the charging nozzle and will report the revised CUFs and CUFs adjusted for environmental effects at these locations as an amendment to the PINGP LRA. The applicant further states that amendment will also include changes to LRA Section 4.3.3, “PINGP EAF Results,” that reflect analysis results and remove references to stress-based fatigue monitoring.

The applicant also provided its commitment to evaluate the effects of insurge/outsurge transients on the lower head of the pressurizer and to eliminate references to stress-based fatigue monitoring by making changes to the LRA. In addition, the applicant also included the following change to the LRA:

> "In LRA Section 4.3.1.3, the last paragraph on Page 4.3-10 and the first paragraph on Page 4.3-11 are deleted and replaced in their entirety with the following:

NSPM will perform an ASME Code Section III fatigue evaluation of the lower head of the pressurizer to account for effects of insurge/outsurge transients. The evaluation will determine the cumulative fatigue usage of limiting pressurizer component(s) through the period of extended operation. The analyses will account for periods of both “Water Solid” and “Standard Steam Bubble” operating strategies. Analysis results will be incorporated, as applicable, into the Metal Fatigue of Reactor Coolant Pressure Boundary Program. This analysis and any associated program enhancements will be completed prior to the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will manage metal fatigue of the pressurizer due to insurge/outsurge transients in accordance with 10 CFR 54.21(c)(1)(iii).

The following additional LRA changes are also being made to eliminate references to stress-based fatigue monitoring:

In LRA Section A3.2, on Page A-17, the third sentence of the first paragraph is deleted and replaced in its entirety with the following: "The program also tracks fatigue usage in critical high-usage components."

In LRA Section B3.2, Program Description, on page B-84, the third sentence of the first paragraph is deleted and replaced in its entirety with the following: "The program also tracks fatigue usage in critical high-usage components."

In LRA Section B3.2, Enhancements, on page B-85, the first bulleted enhancement is deleted and replaced in its entirety with the following:

Scope of Program, Preventive Actions, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending

The program will monitor the six component locations identified in NUREG/CR-6260 for older vintage Westinghouse plants, either by tracking the cumulative number of imposed stress cycles using cycle counting, or by tracking the cumulative fatigue usage, including the effects of coolant environment. The following locations will be monitored:

NUREG/CR-6260 Location
RPV Inlet and Outlet Nozzles
RPV Shell to Lower Head
RCS Hot Leg Surge Line Nozzle
RCS Cold Leg Charging Nozzle

RCS Cold Leg Safety Injection Accumulator Nozzle
RHR-to-Accumulator Piping Tee

In addition, the applicant provided its updated Commitment No. 33 and 35 to reflect the changes described above for this program.

The staff reviewed the response provided by the applicant, and found it acceptable. This is because the applicant has confirmed that the CUF values in the LRA are all calculated in accordance with ASME Code Section III using the values of six stress components except for those of the surge line hot leg nozzle safe end and the charging nozzles. For these two locations, the applicant indicates that new analyses in accordance with ASME NB procedures are in the process and the new results will be reported as an amendment to the PINGP LRA. As a result of this RAI, the applicant added a new item in its License Renewal Commitment, No. 36. The staff notes that the corrective actions taken by the applicant in response to this RAI are consistent with the aging management program requirements described in the GALL Report. Therefore, the staff's concern in RAI 4.3.1.1-1 is resolved.

The staff reviewed the new commitment, License Renewal Commitment No. 36, and the updated Commitments No. 33 and 35 as described below. The LRA states that upon the staff review and approval, the final commitments will be incorporated into the UFSAR.

The staff noted that pursuant to commitment 36 (1) PINGP will re-evaluate fatigue usage using the well-established ASME III NB guidelines for the pressurizer surge line hot leg nozzle and the charging nozzle which were previously evaluated using the simplified method in FatiguePro; (2) PINGP will remove any reference to “stress-based fatigue monitoring.” The staff found the commitment acceptable because this commitment will ensure that all PINGP fatigue analyses will use six stress components and therefore consistent with ASME Code Section III. This commitment was completed and provided to the staff by letter dated April 28, 2009. The staff's review of the applicant's April 28, 2009 submission is discussed in Section 4.3.3.1 and 4.3.3.2.

The staff reviewed the updated License Renewal Commitment 33 and found it acceptable because, pursuant to the SRP-LR and GALL Reports, it commits to address the effects of the coolant environment on component fatigue life for the six NUREG/CR-6260 locations (or components) applicable to PINGP. License Renewal Commitment 33 also includes a provision stating that corrective action will be taken before a cumulative fatigue usage factor exceeds 1.0 or a design basis transient cycle limit is exceeded. The staff reviewed the LRA and confirmed that PINGP has a corrective action program (CAP) for the safety classification of the structure or component and that the CAP requirements are established to meet the requirements of the NMC Quality Assurance Topical Report and 10 CFR 50, Appendix B. Based on its review, the staff found License Renewal Commitment 33 acceptable because it is consistent with the SRP-LR, the GALL Reports and 10 CFR 50 Appendix B. License Renewal Commitment 33 also implements the well-established ASME Code III NB-3200 method to perform fatigue evaluation in lieu of the simplified method indicated in the original version of the commitment. Therefore, License Renewal Commitment 33 is acceptable.

The staff reviewed the updated License Renewal Commitment 35 and found it acceptable because it is a direct response to NRC Bulletin 88-11, which describes conditions that may affect compliance with the requirements in 10 CFR 50.55a. Commitment 35 also implements the well-established ASME Code III NB-3200 method to perform fatigue evaluation in lieu of the simplified method indicated in the original version of the commitment. Therefore, License Renewal Commitment 35 is acceptable.

4.3.1.2.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names/types, design cycles and 60-year cycle projections, and concluded that the CUF for the Class 1 components based on those transients will remain valid for the period of the extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for Class 1 components is adequate.

4.3.1.2.4 Conclusion

Based on its LRA review, the staff found that the applicant has demonstrated that the TLAA for the Reactor Vessel and the CRDM Housing locations will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). The applicant also indicates that the cumulative numbers of design transients experienced by the CRDM housings will continue to be managed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii). This is acceptable because it provides additional assurance. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the Metal Fatigue of Reactor Coolant Pressure Boundary Program and TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.3 Reactor Vessel Internals

4.3.1.3.1 Summary of Technical Information in the Application

LRA Subsection 4.3.1.2 discusses the fatigue evaluation for the RV internal components. The applicant notes that the PINGP reactor vessel internals were designed prior to incorporation of design codes for RV internals into ASME Code Section III. As such, the applicant indicates that a plant-specific stress report for the RV internals was not required. The applicant also indicates that the upper internals of both Units 1 and 2 were replaced in the mid-1980s due to concerns of aging on split pins and the replacement upper internals were evaluated and constructed in accordance with ASME Code Section III, Subsection NG, 1974 Edition through summer 1976 Addenda. The applicant reports the CUF values at selected locations of the replacement RV upper internals in LRA Table 4.3-4.

The applicant notes that the fatigue analysis for the PINGP RV lower internals was not included in the CLB and new fatigue evaluations for the RV lower internals were performed based on the design transients shown in LRA Table 4.3-1. The applicant indicates that the CUF values are acceptable for all locations considered in the RV lower internals fatigue evaluations except for the baffle bolts. For the RV lower internal baffle bolts to meet the fatigue requirements during the period of the extended operation, the applicant reduced the cycles of the plant loading and unloading (at 5 percent of full power per minute) transients for its TLAA fatigue evaluation from the original design cycles of 18,300 to a new value of 1835. As such, the applicant claims that the TLAA for the baffle bolts satisfy the fatigue requirements during the period of the extended operation, pursuant to 10 CFR 54.21(c)(1)(ii).

The applicant also documents the cycle adjustment for the plant loading and unloading (at 5 percent of full power per minute) transients in LRA Section B3.2, and Commitment No. 34, states that the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program and UFSAR Table 4.1-8 will be enhanced to include this additional cyclic limit for baffle bolt fatigue.

The applicant closes this subsection of the LRA with a note stating that the TLAA for the remaining reactor vessel upper and lower internals items continue to be based on the same transients as the reactor vessel, and concludes that the TLAA for these parts/locations is valid for the period of the extended operation per 10 CFR 54.21(c)(1)(i). The applicant also indicates that the cycles of the applicable design transients experienced by the reactor vessel internals, including the baffle bolts, will continue to be managed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.2, pursuant to 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(ii), to verify that the analysis remains valid for the period of the extended operation or has been projected to the end of the period of extended oepration.

The staff found that the applicant's conclusion that the fatigue requirements for the RV upper internals are satisfied in accordance with 10 CFR 54.21(c)(1)(i) is acceptable because the design CUF values are all less than 1.0 and the 60-year projected transient cycles are bounded within the design transient cycles.

For the RV lower internals, the applicant performed new fatigue evaluations because PINGP did not perform fatigue evaluations in the plant design phase. The applicant obtained acceptable fatigue results for all lower RV internal locations except the baffle bolts. By reducing the cycles of the plant loading and unloading (at 5 percent of full power per minute) transients from 18,300 to 1,835, the applicant stated that the baffle bolts will meet the fatigue requirements during the period of extended operation. All design transients that are in LRA Table 4.3-1 were used for the analysis.

The staff found the approach that the applicant used to reach the goal of meeting the fatigue requirement for the lower RV internal baffle bolts acceptable because the 60-year cycles projected for the plant loading and unloading (at 5 percent of full power per minute) transients, 970, is far less than the new limit that the applicant established, 1,835 cycles. In addition, consistent with the GALL Report, the applicant has committed (Commitment No. 34) to enhance the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program to include this additional cyclic limit, 1835, for baffle bolt fatigue. Based on these considerations, the staff finds that the applicant's disposition of the TLAA for the RV internal baffle bolts to 10 CFR 54.21(c)(1)(ii) acceptable.

The staff reviewed License Renewal Commitment 34 and found it acceptable because of the following reasons:

(1) It clearly states that the new cycle limit, 1835, is for both the plant loading at 5 percent of full power per minute and the plant unloading at 5 percent of full power per minute transients and is applicable to the lower RV Internal baffle bolts only.

(2) The new cycle limit mentioned above will be incorporated into the Metal Fatigue of Reactor Coolant Pressure Boundary Program and UFSAR Table 4.1-8.

(3) Resetting the cycle limit for the plant loading and plant unloading (at 5 percent of full power per minute) transients is a necessary adjustment to allow the lower RV internal baffle bolts meeting the fatigue requirements. The new cycle limit, 1835, still bounds the 60-year projected cycles (970) for this particular pair of transients, with sufficient margin.

4.3.1.3.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names/types, design cycles and 60-year projections, and stated that the CUF for the Class 1 components based on those transients will remain valid for the period of extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for Class 1 components is adequate.

4.3.1.3.4 Conclusion

Based on its review of LRA Section 4.3.1.2, the staff found the applicant's claim that the TLAA for all parts of the RV internals except for the baffle bolts satisfy 10 CFR 54.21(c)(1)(i). For the RV internals baffle bolts, the TLAA satisfies 10 CFR 54.21(c)(1)(ii) by reducing design cycle limit to 1,835 cycles for the plant loading and unloading (at 5 percent of full power per minute) transients. The applicant indicates that the cycles of the applicable design transients experienced by the reactor vessel internals, including the baffle bolts, will continue to be managed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii). This is acceptable since it provides additional assurance. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.4 Pressurizers

4.3.1.4.1 Summary of Technical Information in the Application

The applicant presents the results of the fatigue usage analysis of the pressurizers in LRA Table 4.3-5, in LRA Section 4.3.1.3. The applicant notes that the fatigue analyses for Units 1 and 2 were performed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III, 1965 Edition and addenda including Summer of 1966 for Unit 1 and Winter 1966 for Unit 2, respectively. The applicant also notes that both pressurizers are cylindrical vessels with cast upper and lower heads.

The applicant states that these usage factor calculations are considered TLAAs because they are based on design transients intended to represent 40 years of operation. The applicant concludes that these TLAAs will remain valid through the period of the extended operation in accordance with 10 CFR 54.21(c)(1)(i) because, Table LRA 4.3-1 indicates the cycles projected to occur for 60 years are bounded by those used in the original design analyses.

The applicant notes that the CUF results shown in Table 4.3-5 do not include the effects of insurge/outsurge and thermal stratification. The staff notes that these thermal events are associated with PWR pressurizers, but were not known to the nuclear industry until NRC issued Bulletins 88-08 and 88-11 in 1988.

The applicant indicates that license renewal applicants are expected to demonstrate that pressurizer components have been analyzed for cumulative fatigue usage through the period of extended operation, and that the analyses include insurge/outsurge and other transient loads not considered in the current licensing basis.

The applicant indicates that PINGP will perform a fatigue evaluation of pressurizer and surge line locations affected by insurge/outsurge transients. This evaluation will determine the CUF from past operation, accounting for the periods of both "Water Solid" and "Standard Steam Bubble" operating strategies, and will project the CUF of selected locations into the renewed license term. The applicant also indicates that if applicable, the analysis results will be incorporated into the Metal Fatigue of Reactor Coolant Pressure Boundary Program. The applicant indicates that these analyses will be completed prior to the period of the extended operation.

The applicant further indicates that the Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to include monitoring of the pressurizer heater penetration, pressurizer surge nozzle, surge line elbow, and hot leg surge nozzle to monitor the effects of insurge/outsurge transients. The applicant states that with this enhancement, the program will manage metal fatigue of the pressurizer due to insurge/outsurge transients in accordance with 10 CFR 54.21(c)(1)(iii).

The applicant notes that the current plant operating practices mitigate insurge/outsurge effects in the pressurizer through continuous spray during heatup and cooldown transients. The applicant notes that this method maintains a small flow from the pressurizer to the hot leg during these transients, thus resulting in a uniform fluid temperature below the pressurizer heaters and in the upper portion of the surge line that prevent thermal stratification. The applicant further notes that, plant heatup and cooldown procedures have adopted, in 1991, the Westinghouse Modified Operating Procedure (MOP). This procedure uses the "Water Solid" method for heatups and cooldowns to reduce the magnitude of resulting insurge/outsurge temperature transients at the pressurizer. The applicant also notes that prior to 1991, heatups and cooldowns used the "Standard Steam Bubble" method, which have resulted in larger temperature transients and higher fatigue usage.

4.3.1.4.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.3, pursuant to 10 CFR 54.21(c)(1)(iii), to verify that metal fatigue in the pressurizer lower head region will be adequately managed during the period of the extended operation. The staff reviewed LRA Section 4.3.1.3, pursuant to 10 CFR 54.21(c)(1)(i), to verify that metal fatigue in the pressurizer upper head region will be adequately managed during the period of the extended operation.

The applicant lists the CUF values of the PINGP Units 1 and 2 pressurizers in LRA Table 4.3-5 and claims that the fatigue requirements for these components will be satisfied during the period of the extended operation pursuant to 10 CFR 54.21(c)(1)(i). The applicant determined this because according to LRA Table 4.3-1, the projected 60-year transient cycles are bounded by the cycles used in the original design calculations. The staff found this claim to be premature because, per Note 1 associated with LRA Table 4.3-5, neither the effects of LWR environment nor the effects of insurge/outsurge and thermal stratification have been included in the CUF results shown in LRA Table 4.3-5. Therefore, the LRA Table 4.3-5 CUF values are not valid for the lower head and surge nozzle region. Namely, of the 8 locations listed in LRA Table 4.3-5, the pressurizer surge nozzle, lower head, and instrument nozzle (the one on the lower head side) may not be dispositioned to 10 CFR 54.21(c)(1)(i). Instead, these locations should be managed in accordance with 10 CFR 54.21(c)(1)(iii) under the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program to ensure the intended functions of the pressurizers maintained during the period of extended operation.

LRA Section 4.3.1.3 describes common practices that the current operating plants used to mitigate the effects of the insurge/outsurge transients on the pressurizer and the surge line. Although pressurizer is identified in NUREG/CR-6260 as one of the sample components considered for reactor water environment effects on fatigue life, evaluation of the environmentally-assisted fatigue is separately reported in LRA Section 4.3.3.

The staff notes that since thermal events on the pressurizer and the surge line were unknown to the nuclear industry until issuance of NRC Bulletins 88-08 and 88-11, the likelihood that associated data be available to support fatigue evaluations on stratification and insurge/outsurge events prior to the Bulletin 88-08 issuance seems quite low. Therefore, the staff issued RAI 4.3.1.3-1 in a letter dated December 10, 2008. The staff asked the applicant how did it reconstruct the cycles that occurred before the date of issuance of Bulletin 88-11 to support its TLAA calculations, and to provide the dates when events tracking began.

In its response to RAI 4.3.1.3-1, dated January 9, 2009, the applicant states that the dominant event cycles that contribute to fatigue in the surge line analyses are the heatups and cooldowns that include stratification and striping in the pressurizer surge line. The applicant also states that surge line temperature transients during heatup and cooldown are characterized in WCAP-12839 and WCAP-12639 by maximum system differential temperatures between the pressurizer water and RCS hot leg that occur over five RCS temperature ranges. The applicant states that the system differential temperature ranges were used to define the stratification and the insurge/outsurge events for the purpose of the analyses.

The applicant states that the PINGP Pressurizer-water-to-RCS-hot-leg differential temperature data were recorded since the initial plant operation (1973 for Unit 1, and 1974 for Unit 2). The applicant also states that upon completion of the pressurizer surge line thermal stratification analyses in the early 1990s, PINGP continued to monitor temperature differentials between the pressurizer water and RCS hot leg as required by the Metal Fatigue of Reactor Coolant Pressure Boundary Program to ensure that plant operation is within the bounds of the pressurizer surge line transient definitions contained in WCAP-12839 and WCAP-12639.

In the RAI response, the applicant also indicates the number of plant heatups and cooldowns are limited to 200 by design and the 60-year projection is approximately 125 cycles, as shown in LRA Table 4.3-1.

The staff summarizes its review of the applicant response to RAI 4.3.1.3-1, as follows:

- The surge line stratification and the insurge/outsurge events are predominated by the plant heatups and cooldowns.
- The surge line stratification and the insurge/outsurge events are defined by the system differential temperature ranges.
- The surge line temperature transients during heatup and cooldown are characterized in WCAP-12839 and WCAP-12639 by the maximum system differential temperatures

between the pressurizer water and the RCS hot leg that occur over five RCS temperature ranges.

- PINGP has conducted transient monitoring and collecting the pressurizer-water-to-RCS-hot-leg differential temperature data since initial plant startup (1973 for Unit 1, and 1974 for Unit 2).
- PINGP has the monitored plant data in its possession to support evaluation of the stratification and insurge/outsurge effects – no backward projection is necessary.

On the basis of its review described above, the staff's concern about the possibility of lack of data to support the fatigue evaluation involving stratification and insurge/outsurge thermal events in the pressurizers, surge lines, and surge line nozzles was resolved based on the following reasons:

- The applicant has collected the necessary plant data, in the form of Pressurizer-water-to-RCS-hot-leg temperature differentials, ever since the plant's startup.
- With the monitored data of temperature differentials, stresses and the stress variations during the insurge/outsurge thermal events can be calculated to support fatigue assessment.
- Since the records of pressurizer-water-to-RCS-hot-leg differential temperature data are available for the entire plant's operating history to date, the fatigue results involve no backward projections for better accuracy, ensuring the effects of aging being managed in accordance with a proper disposition to one of the 3 options of 10 CFR 54.21(c)(1).

As a result of RAI 4.3.1.3-1, the applicant also made changes to LRA Section 4.3.1.3, as follows:

> In LRA Section 4.3.1.3, the last paragraph on Page 4.3-10 and the first paragraph on Page 4.3-11 are deleted and replaced in their entirety with the following:
>
> NSPM will perform an ASME Section III fatigue evaluation of the lower head of the pressurizer to account for effects of insurge/outsurge transients. The evaluation will determine the cumulative fatigue usage of limiting pressurizer component(s) through the period of extended operation. The analyses will account for periods of both "Water Solid" and "Standard Steam Bubble" operating strategies. Analysis results will be incorporated, as applicable, into the Metal Fatigue of Reactor Coolant Pressure Boundary Program. This analysis and any associated program enhancements will be completed prior to the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will manage metal fatigue of the pressurizer due to insurge/outsurge transients in accordance with 10 CFR 54.21(c)(1)(iii).

The staff reviewed the changes made to LRA Section 4.3.1.3 resulting from RAI 4.3.1.3-1. The staff found that the TLAA for the pressurizer components is consistent with GALL AMP X.M1. and 10 CFR 54.21(c)(1)(iii).

4.3.1.4.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names/types, design cycles and 60-year projections, and concluded that the CUF for the pressurizer locations based on those transients will remain valid for the period of the extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for pressurizer locations is adequate.

4.3.1.4.4 Conclusion

Based on its review, as discussed above, the staff concludes that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i) that the upper region of the PINGP Units 1 and 2 pressurizer locations remain valid for the period of extended operation. For the pressurizer lower head locations, license renewal Commitment 35 (as discussed in Section 4.3.1.2.2 applies. The commitment states that NSPM will perform an ASME Section III fatigue evaluation for the lower head of the pressurizer to account for effects of insurge/outsurge transients. The evaluation will determine the cumulative fatigue usage of limiting pressurizer component(s) through the period of extended operation. Implementation of license renewal Commitment 35 is scheduled to complete by 8/09/2013 for Unit 1 and 10/29/2014 for Unit 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).

4.3.1.5 Steam Generators

4.3.1.5.1 Summary of Technical Information in the Application

LRA Section 4.3.1.4 discusses the fatigue usage evaluations for the steam generators. The applicant notes that PINGP Unit 1 steam generators (SG) were replaced in November 2004 while the SGs of Unit 2 remain unchanged. The applicant states that fatigue analyses for both SG were performed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III. The applicant also states that the primary and secondary sides are Class 1 and were designed in accordance with ASME Code Section III, 1995 Edition through 1996 Addenda for Unit 1, and 1965 Edition through Winter 1966 Addenda for Unit 2. The applicant further states that these fatigue analyses are considered TLAAs because they are based on the transients and cycles expected to occur in 40 years of operation, as shown in LRA Section 4.3.1. The fatigue results for the PINGP Units 1 and 2 SGs are shown in LRA Table 4.3-6.

Based on the fatigue results in LRA Table 4.3-6 and the results of the 60-year transient cycle projection in LRA Table 4.3-1, the applicant claims that the fatigue requirements for the PINGP SGs will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). During that same period, the applicant states that the design transients actually experienced by the SGs will continue to be managed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii).

LRA Section 4.3.1.4 also includes the experience and effort on inspecting the SG feedwater nozzle and repair of the flawed and eroded components as a result of the inspection. The applicant also performed fatigue crack growth analyses for postulated flaws in the nozzle.

The applicant indicates that in October 1992, NMC (Nuclear Management Company) replaced the feedwater pipe spool pieces on all four SGs (Units 1 and 2) due to a concern of potential thermal fatigue damage to the weld which connects the spool piece to the feedwater nozzle. The applicant also indicates that, through each spool piece, the weld that connected the spool piece to the feedwater nozzle, and part of the original feedwater nozzle were removed. The applicant notes that examinations of the removed items revealed minor cracks at the weld and in the base metal. The applicant further notes that the maximum crack depth was 0.074 inches (in piping upstream of the spool piece to nozzle weld on SG 12). The applicant states that the observed cracking was associated primarily with repair welding performed during construction, and all metal (piping, weld, and nozzle base metal) that contained cracks on each steam generator was removed as part of the repair.

The applicant indicates that it has examined the feedwater nozzle thermal sleeve and found severe erosion on its outside surface (OD). The applicant notes that the maximum erosion depth is approximately 0.128 inches, on SG 21. The applicant further notes that the feedwater nozzle bore and knuckle region for all SGs were subsequently inspected and no indications of degradation or cracking were found.

Because of the erosion, the applicant indicates that thermal hydraulic, fatigue, and fracture mechanics evaluations were performed to justify leaving the thermal sleeves in the as-found condition. The applicant indicates that the analysis shows that fatigue usage in the nozzle bore and knuckle regions, where the stresses are the highest, are well below the limit of 1.0. The applicant further indicates that fracture mechanics analyses were also performed for the nozzle bore and knuckle regions, based on a postulated flaw since there was no actual flaw found.

In the LRA, the applicant indicates that PINGP will monitor Mode 2/3 operations for the SG FW nozzles with the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii) to ensure that the bounds of the fracture mechanics evaluation are not exceeded. However, the applicant notes that the Metal Fatigue of Reactor Coolant Pressure Boundary Program does not apply to Unit 1 SGs because they were replaced in 2004.

LRA Section 4.3.1.4 also presents the results of fatigue analyses for the SG tubes. The applicant states that to prevent the same type of fatigue cracking as that experienced at North Anna Unit 1 on July 15, 1987, PINGP evaluated its SG tubing and performed fatigue usage calculations based on the plant-specific operating conditions. The results indicate that all tubes have an acceptable fatigue usage factor (0.173). However, the applicant indicates that this evaluation is no longer applicable to Unit 1 SGs because they were replaced in 2004.

The applicant states that to account for the MUR-PU, the CUF for the Unit 2 SG U-bend tubing was recalculated, projected to 60 years of operation and the revised 60-year CUF is 0.378. The applicant concluded that the SG tube fatigue usage for Unit 2 is acceptable, pursuant to 10 CFR 54.21(c)(1)(ii), during the period of the extended operation. The applicant also states that the replacement SGs for Unit 1 use stainless steel tube support plates and thus are not susceptible to the denting experienced by the North Anna Unit 1 incident described in NRC Bulletin 88-02.

4.3.1.5.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.4, pursuant to 10 CFR 54.21(c)(1), to verify that the analyses remain valid for the period of the extended operation. In this evaluation, the original steam generator (e.g., Unit 2) is abbreviated as OSG and the replacement steam generator (i.e., Unit 1) is abbreviated as RSG.

In its review of the SG fatigue results shown in LRA Table 4.3-6, the staff noticed a significant difference in CUFs between Unit 1 and Unit 2 at the SG primary inlet nozzle location (CUF=0.007 for Unit 1 and CUF=0.880 for Unit 2). The significant difference also exists at the SG primary outlet nozzle location (CUF=0.006 for Unit 1 and CUF=0.880 for Unit 2). The staff notes that it is understandable for CUF values between Units 1 and 2 will be different because the Unit 1 SGs are recent replacements (RSGs). However, the cited differences are much larger than the staff's expectation. Therefore, the staff issued RAI 4.3.1.4-1, in a letter dated December 10, 2008, in which the staff asked the applicant to explain the significant differences.

In its response to RAI 4.3.1.4-1, dated January 9, 2009, the applicant attributed the described differences to one or more of the following causes:

(1) Differences between the Unit 1 and Unit 2 nozzle geometry and materials of construction. The applicant explained that the Unit 1 RSG primary inlet and outlet nozzles are forged with the primary head and are fabricated from low alloy steel (SA 508 Grade 3 Class 2) whereas those for the Unit 2 OSG primary inlet and outlet nozzles are cast with the primary head and are fabricated from carbon steel (SA 216 Grade WCC). The applicant further indicated that the thickness of the Unit 1 nozzles is less than that of Unit 2 nozzles. The applicant explained that the differences in materials and wall thickness allow the Unit 1 nozzles to respond quicker to temperature transients, thus reducing through-wall gradients, and producing lower thermal stresses than that in the Unit 2 nozzles for a given thermal transient.

(2) Differences in design transients and external nozzle loads and moments used in the fatigue evaluations. The applicant explained that the design transients used in the fatigue evaluation are consistent between Units 1 and 2. The applicant also indicated that the external loads and moments applied to the Unit 1 nozzles are equivalent to or bound those used for Unit 2 analysis of the nozzles.

(3) Differences in methodology of CUF calculations. The applicant explained that the calculation for the Unit 1 RSG primary inlet and outlet nozzles CUF is based on the finite element method which allows the fatigue usage calculations to be performed in accordance with ASME III NB-3222.4 (e)(5) procedures, adding partial usage contributed from stress pairing among the design transients. The applicant also indicates that the calculation for the Unit 2 SG primary inlet and outlet nozzles CUF was based on the worst-case normal and upset loading conditions, and the results of the peak stress intensities determined from the worst loading conditions were conservatively given to every transient that the system will have to endure. The applicant indicates that altogether there are 24,000 cycles for the transients listed in Table 4.3-1 of the PINGP LRA. This resulted in a very conservative cumulative usage factor of 0.88 as reported in LRA Table 4.3-6.

The staff evaluated the applicant's response to RAI 4.3.1.4-1 as follows:

For cause (1), while the thinner wall thickness in the Unit 1 RSG primary inlet and outlet nozzles tends to reduce the through-wall temperature gradient (as the applicant argued), the lower thermal diffusivity of SA-508, which is used in Unit 1 RSG primary inlet and outlet nozzles has the opposite effect. This is because the thermal diffusivity of low alloy steel SA-508 (used in Unit 1 RSG) is lower than that of the SA-216 carbon steels (used in Unit 2 OSG), and substances with lower thermal diffusivity adjust their temperature to that of their surroundings more slowly. Therefore, the effects due to differences in geometry and material will cancel each other somewhat. In addition, thinner wall thickness in Unit 1 RSG will have higher stresses from the pressure and mechanical loads.

Cause (2) obviously is a non-contributor because Unit 1 RSG primary inlet and outlet nozzles and Unit 2 OSG primary inlet and outlet nozzles are subject to similar thermal and piping loads.

Cause (3) is significant because the original evaluations performed in the early 1970s are bounding analyses. Consequently, the results are likely very conservative. In its description of Cause 3, the applicant indicated that the worst-case normal and upset loading condition was used in the original analysis for the OSG primary inlet and primate outlet nozzles, and it was assumed this was the only transient that these components will be subject to, and this transient was repeated 24,000 times. In a teleconference held on February 10, 2009, the staff requested the applicant to identify "the worst-case normal and upset loading condition transient" indicated in the response to RAI 4.3.1.4-1 and provide the source which leads to the 24,000 number. The applicant responded in the same teleconference saying that the worst-case normal and upset loading condition transient was represented by the Loss of Flow (partial loss of flow, one pump only) transient, which falls in the upset condition category of Table 4.3-1 of the LRA. The staff found the choice reasonable, since this transient involves a near step-change temperature condition with a significant temperature variation, which is severe. As for the value of 24,000 for the number of cycles, the applicant explained that it was a round-up of the sum of the cycles of all the transients listed in LRA Table 4.3-1, but not double counting the paired types of transients such as Heatup/Cooldown, Plant Loading/Plant Unloading, Step Load Increase/Step Load Decrease, and not to include Steady State Fluctuations. The staff found the transient selected and the cycles used are both conservative and therefore are acceptable.

On the basis of its review and evaluations as described above, the staff found that the applicant's response does provide explain the significant differences in the CUF values as described in RAI 4.3.1.4-1. Among the three causes suggested by the applicant, only Cause (3) provides a very strong reason because the bounding analysis described in Cause (3) is meant to be conservative whereas the modern analysis, finite element analysis, and transient peak stress intensity pairing performed for Unit 1 RSG was aimed to provide a more realistic and accurate results. The staff's concern is therefore resolved.

In LRA Section 4.3.1.4, the applicant discusses fracture mechanics analyses for the steam generator feedwater nozzle and performed fracture mechanics analyses to justify leaving the eroded thermal sleeves in the as-found condition. Since, as indicated in the LRA, all flawed parts have been removed and repaired, and the follow up inspection found no indications of degradation or cracking, the staff did not understand why the applicant considered fracture mechanics evaluation for the steam generator feedwater nozzles a time-limited aging analysis

(TLAA). Therefore, the staff issued RAI 4.3.1.4-2, in a letter dated December 10, 2008, asking the applicant to explain and clarify.

In its response to RAI 4.3.1.4-2, dated January 9, 2009, the applicant states that the Steam Generator Fatigue and Fracture Mechanics Evaluation of Feedwater Inlet Nozzle discussion was conservatively included in LRA Section 4.3.1.4 even though the analysis did not meet all six criteria in 10 CFR 54.3(a) for defining a TLAA. In particular, the applicant indicates that the analysis did not meet criterion (3) in that it did not "involve time-limited assumptions defined by the current operating term, for example, 40 years."

The applicant further states that the crack growth analysis does not provide a basis for demonstrating that a known flaw is acceptable for continued operation for the life of the plant, and the analysis simply defined an appropriate examination frequency that is based on a postulated flaw of a certain size. The applicant also states that since the crack growth analysis is not managing an actual (existing) crack and the analysis was not performed for the service life of the component (i.e., 40 years), this evaluation is not a TLAA.

The applicant further states that NSPM monitors the Unit 2 feedwater nozzle to pipe transition forging welds for evidence of cracking using ultrasonic inspection through owner-elected examinations maintained within the PINGP ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. These periodic examinations ensure that the feedwater nozzle region remains free of cracks.

As a result, NSPM determined that the discussions about the flaw evaluation should be removed from the LRA and provided the change in the January 9, 2009 response letter.

On the basis of its review described above, the staff found the applicant’s response to RAI 4.3.1.4-2 acceptable because there was no actual flaw found in the Unit 2 SG feedwater inlet nozzle and the applicant made the necessary clarification that it does not meet the TLAA criteria. Instead, the applicant will monitor the Unit 2 SG feedwater nozzle to pipe transition forging welds for evidence of cracking using ultrasonic inspection through owner elected examinations maintained within the PINGP ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

4.3.1.5.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names/types, design cycles and 60-year projections, and concluded that the CUF for the SG locations based on those transients will remain valid for the period of the extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address fatigue analyses for SG locations is adequate.

4.3.1.5.4 Conclusion

Based on the review of the LRA, the staff found that the applicant has demonstrated conformance to 10 CFR 54.21(c)(1)(i) for the steam generators. However, for Unit 2 SG tubes, the TLAA is pursuant to 10 CFR 54.21(c)(1)(ii) and for Unit 2 SG FW nozzle, the TLAA is pursuant to 10 CFR 54.21(c)(1)(iii). The staff also concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the Metal Fatigue of Reactor Coolant Pressure Boundary Program and TLAA evaluation, as required by 10 CFR 54.21(d).

The staff also concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.6 Reactor Coolant Pumps

4.3.1.6.1 Summary of Technical Information in the Application

LRA Section 4.3.1.5 discusses fatigue usage analyses for the reactor coolant pump (RCP). The applicant states that fatigue analyses of the RCPs are considered TLAAs because they are based on the numbers of design cycles expected to occur in 40 years of operation. The results are shown in LRA Table 4.3-7.

Based on the CUF values shown in Table 4.3-7 and the results of 60-year cycles projections shown in Table 4.3-1, the applicant concluded that the PINGP RCP fatigue analyses will not be exceeded in 60 years of operation and these TLAAs will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

However, the applicant indicates that the design transients experienced by the reactor coolant pumps will continue to be managed by the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program and RCP fatigue is managed in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.6.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.5, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of the extended operation.

The applicant presents the fatigue usage results of Casing, Main Flange, Main Flange Bolts, Thermal Barrier Flange, and Water Connections in LRA Table 4.3-7. In LRA Section 4.3.1.5, the applicant states that exemption from fatigue evaluation was justified for the casing feet, casing nozzle, and upper and lower seal housings and bolts, but did not support this statement with a regulatory basis. The staff issued RAI 4.3.1.5-1, in a letter dated December 10, 2008, requesting the applicant to provide technical and regulatory basis for exempting these components from being within the scope of an ASME Code Section III CUF analysis.

In its response to RAI 4.3.1.5, dated January 9, 2009, the applicant states that the RCPs were designed in accordance with Article 4 of ASME Code Section III through the 1970 Winter Addendum. Exemption from fatigue evaluation was justified in accordance with ASME Code Section III, Article 415.1, for the casing feet, casing nozzle, and upper and lower seal housings and bolts. The applicant states that the applicable RCP calculations used to show compliance with ASME Code Article N-415.1, (a) through (f) are based on design transients that bound those presented in LRA Table 4.3-1, and are intended to represent 40 years of operation.

The staff noted that, in this part of the response to the RAI, a different set of transients must have been used to support the sentence “bound those presented in LRA Table 4.3-1” appeared in the RAI response. Therefore, a teleconference was held, requesting the applicant to identify what transients were considered. The applicant responded in the same teleconference, indicating that they used the Westinghouse generic transients. The staff found this clarification acceptable because the Westinghouse generic transients are intended to be conservative so they are applicable to all Westinghouse design PWR plants. Since the applicable RCP calculations which show compliance with Article N-415.1 were performed based on the bounding Westinghouse generic transients, exemption from fatigue evaluation for the casing feet, casing nozzle, and upper and lower seal housings and bolts is justified. Based on this consideration, the staff's concern on this matter is resolved.

The applicant further indicates in the response to RAI 4.3.1.5 that the numbers of analyzed design transients used in the RCP exemption from fatigue analyses required by Article N-415.1 for the casing feet, casing nozzle, and upper and lower seal housings and bolts, will not be exceeded in 60 years of operation, and these TLAAs will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). The staff found this disposition acceptable because the projected 60-year cycles are bounded by the design cycles and ASME Code Article N-415.1 conformance is demonstrated by the bounding analyses.

4.3.1.6.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names/types, design cycles, and 60-year projections, and concluded that the CUF for the RCP locations based on those transients will remain valid for the period of the extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for RCP locations is adequate.

4.3.1.6.4 Conclusion

Based on the review of the LRA, the staff found that the applicant has demonstrated conformance to 10 CFR 54.21(c)(1)(i) for PINGP RCP TLAA. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the Metal Fatigue of Reactor Coolant Pressure Boundary Program and TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.7 Class 1 Piping

4.3.1.7.1 Summary of Technical Information in the Application

LRA Section discusses the fatigue evaluation of the Class 1 piping. The applicant indicates that the PINGP Class 1 boundary corresponds to all RCS pressure boundary components within the ASME Code Section XI, IWB inspection boundary, and that all RCS piping components, except a portion of the Reactor Coolant Gas Vent System (RCGVS) piping and Reactor Vessel Level Instrument System (RVLIS) piping attached to the RV closure head, were originally designed in accordance with the American Standard Code for Pressure Piping (ASA) B31.1, 1955 Edition (Unit 1) and USA Standard Code for Pressure Piping (USAS), B31.1.0 1967 Edition (Unit 2).

The applicant further states that the RCGVS and RVLIS piping subassemblies have been replaced and the new piping subassemblies are constructed in accordance with ASME Code

Section III, Subsection NB, 1983 Edition for the RCGVS piping subassembly and the 1998 Edition through 2000 Addenda for the RVLIS piping subassembly. The applicant indicates that since these piping subassemblies are less than 1-inch nominal pipe size, they were analyzed to ASME III Subsection NC requirements, in accordance with NB-3630(d).

The applicant indicates that the primary Class 1 piping fatigue evaluations were originally performed in accordance with USAS B31.1.0 and ASME Code Section III Subsection NC. For the reactor coolant piping, the analysis was performed to ensure that the stress range is within the limits prescribed in B31.1.0. The applicant indicates that B31.1.0 does not require fatigue analysis and so none was performed for reactor coolant loop piping. The applicant notes that stress range reduction factors are used to account for anticipated transients and further notes that normally, a stress range reduction factor of 1.0 is acceptable in the stress analyses for up to 7,000 cycles. The applicant indicates that the stress analysis of the primary coolant piping is considered a TLAA since the stress range reduction factor is dependent on the number of design transient full temperature cycles.

The applicant states that the thermally induced stresses arising from temperature gradients are limited to a safe and low order of magnitude in assigning a maximum permissible time rate of temperature change on plant heatup, cooldown, and incremental loadings in the plant operating procedures. The applicant further states that the numbers of full temperature thermal cycles experienced by RCS piping is subject to the transient cycle limits identified in Table 4.3-1, and will not exceed 7000 cycles in 60 years of operation. Therefore, the applicant concluded that the Class 1 piping B31.1.0 stress calculations are valid for the period of extended operation and the TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). However, the applicant states that the cumulative numbers of design transients experienced by the main coolant large bore piping will continue to be managed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii).

The staff notes that the discussion shown above applies to all parts of the Class 1 piping except the surge line, which is described below.

Pressurizer Surge Line Piping. The applicant states that it has responded to NRC Bulletin 88-11, to re-evaluate (in accordance with ASME B&PV Code Section III, Subsection NB 1986 Edition) the pressurizer surge line, including hot leg nozzle and pressurizer surge nozzle, to incorporate the effects of thermal stratification. The applicant notes that the original design of the plant did not consider thermal stratification of the surge line in its analyses. The applicant also notes that NRC Bulletin 88-11 mandates utilities to establish and implement a program to confirm pressurizer surge line integrity in view of the occurrence of thermal stratification as a result of the plant heatup/cooldown cycles.

The applicant states that PINGP participated in a program to assess the impact of thermal stratification on the surge line (including hot leg nozzle and pressurizer surge nozzle) and the PINGP operating procedures were modified to mitigate the severity of transients resulting from pressurizer surges during heatup and cooldown. The applicant notes that PINGP responses to NRC Bulletin 88-11 were provided in Reference 15 and Reference 16 of the LRA, and the NRC approved its analysis results for Units 1 and 2 in References 14 and 13 of the LRA, respectively.

In the section, the applicant presents the maximum CUF values. For Unit 1, the maximum CUF for surge line is 0.90 (at the reducer under the pressurizer) and the maximum CUF at the hot leg surge nozzle is 0.70. For Unit 2, the maximum CUF for the surge line is 0.85 (at the hot leg nozzle).

The applicant states that the site-specific evaluations of the pressurizer surge line are considered TLAAs since the evaluations use time-limited assumptions. The applicant indicates that the dominant cycles in the surge line analysis are the 200 design heatup and cooldown transients shown in Table 4.3-1 with various system differential temperatures that include the stratification and striping associated with those transients.

The applicant claims that, based on the 60-year projected cycles shown in LRA Table 4.3-1, since the number of analyzed heatups and cooldowns, as well as the other design transients presented in Table 4.3-1 will not be exceeded in 60 years of operation, this TLAA will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). At the same time, the applicant states that the cumulative numbers of design transients experienced by the pressurizer surge line will continue to be managed by the PINGP Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.7.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.6, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of the extended operation.

The staff found the applicant's claim that the Class 1 piping TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) acceptable based on the reasons described below:

For the piping components other than the surge line: The PINGP primary Class 1 piping is designed in accordance with USAS B31.1.0 or ASME Code Section III Subsection NC and no explicit fatigue analysis is required. The fatigue requirements under these Codes are incorporated in the allowable stress range requirements along with appropriate stress range reduction factors. If the number of full temperature thermal cycles experienced by the piping is less than 7000, no reduction will be imposed upon the allowable stress range. If the 7,000-cycle criterion is exceeded, appropriate reduction factors will be applied depending on the number of cycles the piping actually experienced. Since the total numbers of full temperature thermal cycles that the PINGP RCS piping will experience would not exceed 7,000 cycles in 60 years of operation, the TLAA for this group of piping remains valid for the period of extended operation.

For the surge line piping: Since the projection shows that the number of heatup and cooldown cycles used for the analyses, as well as the other design transients presented in Table 4.3-1 will not be exceeded in 60 years of operation, the TLAA for this group of piping remains valid for the period of extended operation.

4.3.1.7.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names/types, design cycles and 60-year projections, and concluded that the CUF for the Class 1 pipings based on those transients will remain valid for the period of the extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for Class 1 pipings is adequate.

4.3.1.7.4 Conclusion

Based on the review of the LRA, the staff found that the applicant has demonstrated conformance to 10 CFR 54.21(c)(1)(i) for PINGP Class 1 Piping TLAA. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the Metal Fatigue of Reactor Coolant Pressure Boundary Program and TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2 Non-Class 1 Fatigue

4.3.2.1 Summary of Technical Information in the Application

In LRA Section 4.3.2, the applicant discusses the fatigue evaluation for non-Class 1 components and indicates that PINGP adopts the fatigue screening criteria provided in industry guidance to identify locations potentially susceptible to fatigue cracking for non-Class 1 components. The applicant indicates that, per the guidance, those components which are operating below the temperature thresholds, 220 ^{o}F for carbon steels and 270 ^{o}F for stainless steels, may be exempted from fatigue consideration.

LRA Section 2.0 identifies the non-Class 1 mechanical components within the scope of License Renewal that are subject to aging management review. The applicant fits them in two major categories: (1) piping and in-line components (tubing, piping, traps, thermowells, valve bodies, etc.); and (2) non-piping components (tanks, vessels, heat exchangers, pump casings, turbine casings, etc.).

The applicant indicates that all mechanical systems within the scope of License Renewal were reviewed to identify components within the systems that meet the temperature screening criteria shown above and the PINGP Piping Attributes, Piping Specifications and P&IDs were used to determine system design and operating temperatures for each system. The applicant also indicates that Non-Class 1 components that exceeded the temperature screening criteria were reviewed to determine whether the number of full temperature design cycles for piping and in-line components would be exceeded at 60 years, and whether the design basis of the affected vessel, heat exchanger, storage tank, or pump contain any specific fatigue design requirements.

The applicant's finding is summarized below.

<u>For Piping and In-Line Components</u>. The applicant states that the impact of thermal cycles on non-Class 1 piping and in-line components is reflected in the calculation of the allowable stress range. The applicant notes that ASME Code Section III, Class 2 and 3, and B31.1.0 design codes all incorporate a stress range reduction factor for determination of the acceptability of piping design with respect to thermal stresses. The applicant indicates that in general, a stress range reduction factor of 1.0 in the stress analyses applies for up to 7,000 thermal cycles. The allowable stress range is reduced by the stress range reduction factor if the number of thermal cycles exceeds 7,000. The applicant indicates that for PINGP, the projected thermal cycles for

60-years of plant operation is less than 7,000 cycles. Therefore, the pipe stress calculations remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

For Pressure Vessel, Heat Exchangers, Storage Tanks and Pumps. The applicant indicates that PINGP non-Class 1 vessels, storage tanks and pumps within the scope of License Renewal were designed in accordance with ASME Code Section III Class C (or 3) ASME Code Section VIII or equivalent. The applicant also indicates that there are no specific fatigue design requirements for PINGP non-Class 1 vessels, heat exchangers and pumps.

The applicant states that the tube and shell sides of the regenerative heat exchangers, residual heat exchangers, letdown and excess letdown heat exchangers, and sample heat exchangers were designed in accordance with ASME Code Section III Class C, or ASME Section VIII, Division 1. The applicant also indicates that the equipment specification requires that the supplier verify that all conditions of ASME Code Section III, Paragraph N-415.1 (i.e., exemption from fatigue evaluation for Class 1 components), are satisfied for the transient conditions specified in the equipment specification. The applicant further indicates that the design transients identified in the equipment specifications were reviewed and confirmed consistence with the design transients defined in Table 4.1-8 of the UFSAR (also shown in Table 4.3-1 of LRA). The applicant indicates that since the design transient cycles bound the projected 60-year cycles, the exemption from fatigue evaluation considered in the original design of all these exchangers will remain valid during the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). At the same time, the applicant indicates that the cumulative numbers of design transients experienced by all these heat exchangers will continue to be managed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of the extended operation.

The staff notes that no explicit fatigue evaluation is required for Class 2 and 3 components designed according to ASME Code III or USAS B31.1.0 design Codes. Furthermore, for Class 2 and 3 components, the fatigue requirement is reflected in the allowable stress range such that the fatigue requirement is met if the total number of cycles of all full-thermal range transients experienced by the component is kept within 7,000 cycles. For this class of components, it is required that the maximum allowable stress range be reduced if the total number of full thermal transient cycles do exceed 7,000.

The staff noted that Class 2 and 3 components are associated mostly with heatup or cooldown transients, which are limited to 200 cycles for PINGP. The staff noted that even by adding all cycles applicable to Class 1 components in LRA Table 4.3-1, the projected 60-year cycles are well below the 7,000-cycle criterion. This cycle count excludes the steady state fluctuations, which would have no effect on fatigue and excludes the load/unload cycles, which would not be applicable to Class 2 and 3 piping. By rule, the staff found that the applicant's claim that the PINGP non-Class 1 (Class 2 and 3) piping will continue to meet the fatigue requirements during the period of extended operation acceptable because it satisfies the 7,000-cycle criterion and thus this TLAA can be disposed in accordance with 10 CFR 54.21(c)(1)(i).

The staff notes that no explicit fatigue evaluation is required for Class 2 and 3 vessels, heat exchangers and pumps designed according to ASME Code Section III Class C (or 3), or ASME Code Section VIII, Division 1. The staff notes that if a component is qualified for exemption from fatigue evaluation for the current licensing basis (CLB), the exemption for the same component will remain valid during the period of extended operation if the projected 60-year cycles are bounded by the design transient cycles. PINGP does satisfy this transient cycle requirement.

Based on this consideration, the staff found that the applicant's claim that the current exemption from fatigue evaluation for the regenerative heat exchangers, residual heat exchangers, letdown and excess letdown heat exchangers, and sample heat exchangers will remain valid during the period of extended operation acceptable in accordance with 10 CFR 54.21(c)(1)(i). This is because the PINGP projected 60-year cycles are bounded by the design transient cycles.

4.3.2.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names and types, design cycles, and 60-year projections, and concluded that the CUF for the Non-Class 1 components based on those transients will remain valid for the period of the extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for Non-Class 1 components is adequate.

4.3.2.4 Conclusion

On the basis of the review of the LRA, the staff concludes that the applicant has demonstrated conformance to 10 CFR 54.21(c)(1)(i) that the CLB analyses have been projected to the end of the period of extend operation for the non-Class 1 piping, and all non-Class 1 exchangers. The applicant indicates, that the transients experienced by the applicable heat exchangers will continue to be managed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii). This is acceptable since it provides added assurance.

The staff also concludes that the UFSAR supplement contains an appropriate summary description of the activities for managing the effects of aging and the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 Environmentally-Assisted Fatigue (GSI-190)

4.3.3.1 Summary of Technical Information in the Application

The staff notes that LRA Section 4.3.3 was revised after the applicant completed license renewal Commitment 36. By letter dated April 28, 2009, NSPM provided the staff updated fatigue analysis, upon completion of license renewal Commitment 36. Enclosure 1 of this letter transmits the LRA amendment with the updated analysis results. The completion of this commitment caused LRA Section 4.3.3 to be amended in its entirety.

In LRA Section 4.3.3, the applicant states that it has responded to NRC SECY-95-245 by evaluating environmentally-assisted fatigue (EAF) for some selected component locations to support its application for license renewal. The applicant also states that NUREG/CR-6260 identified locations of interest for consideration of environmental effects. The staff notes that NUREG/CR-6260 (entitled: "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components") contains a list of sample locations which have been evaluated for the effects of LWR environments on fatigue. The list includes older and newer vintages of both BWR and PWR nuclear power plants of B&W, CE, GE, and Westinghouse designs. The applicant indicates that Section 5.5 of NUREG/CR-6260 is intended for older vintage Westinghouse plants, which is applicable to PINGP, and the corresponding PINGP locations are as follows:

- Reactor vessel shell and lower head
- Reactor vessel inlet and outlet nozzles
- Pressurizer surge line (hot leg nozzle safe end)
- RCS piping charging system nozzle
- RCS piping safety injection accumulator nozzle
- RHR Class 1 piping tee

The applicant indicates that it performed EAF evaluations for all six NUREG/CR-6260 locations listed above in accordance with the guidelines provided in NUREG/CR-5704 for austenitic stainless steels and NUREG/CR-6583 for carbon steels and low-alloy steels.

The applicant indicates that of the 6 NUREG/CR-6260 locations, the design basis cumulative usage factors for the reactor vessel shell and lower head, and the reactor vessel inlet and outlet nozzles are reported in LRA Section 4.3.1.1. The CUF calculated in response to NRC Bulletin 88-11 are reported in LRA Section 4.3.1.6 for the pressurizer surge line piping (including the hot leg surge nozzles). The applicant determined that for the pressurizer surge line, the limiting location is at the safe end connected to the hot leg nozzle.

The applicant indicates that since the PINGP primary Class 1 piping NUREG/CR-6260 locations are designed in accordance with B31.1.0, explicit fatigue analyses were not required. To support the LRA, the applicant performed fatigue analyses for the charging system nozzle, safety injection accumulator nozzle, the RHR Class 1 piping tee, and the pressurizer surge line hot leg nozzle.

The applicant indicates that it performed fatigue usage evaluations for the safety injection accumulator nozzle and the RHR Class 1 piping tee in accordance with ASME Code Section III, 1989 Edition guidelines, with 1989 Addenda, and the results are shown in the amended LRA Table 4.3-8. The applicant indicates that the transients applicable to these locations include inadvertent RCS depressurization, inadvertent accumulator blowdown, RHR operation during plant cooldown, RCS refueling, high head safety injection, and Operational Basis Earthquake (OBE).

The applicant indicates that fatigue evaluations for the charging system nozzle and surge line hot leg nozzle were calculated using ASME Code Section III, 2001 Edition with 2003 Addenda based on NSSS design transients shown in LRA Table 4.3-1. The applicant states that in addition to the bounding NSSS design transients, other types of transients that are applicable to these components were also included in the fatigue evaluations. Namely, for the charging nozzle, these include inadvertent RCS depressurization, inadvertent auxiliary spray actuation, excessive feedwater flow, RCS refueling, and OBE. For the surge line hot leg nozzle, these include inadvertent RCS depressurization, inadvertent auxiliary spray actuation, control rod drop, excessive feedwater flow, RCS refueling, and OBE. The applicant further indicates that for the charging nozzle, additional transients including charging/letdown system flow shutoff and flow change transients were used. The applicant indicates that these two transients were derived based on a standard set of Westinghouse design transients for auxiliary systems, modified for the expected number of occurrences at 60 years. The applicant indicates that the cycles of all the transients used for the fatigue evaluations for these components were the expected number of cycles at 60 years.

Based on the results shown in the amended LRA Table 4.3-8, the applicant concluded that the EAFs for all amended LRA Table 4.3-8 locations have been projected to the end of the period of extended operation, pursuant to 10 CFR 54.21(c)(1)(ii). Bound by License Renewal Commitment No. 33, the applicant stated that EAF at all NUREG/CR-6260 locations will be managed using cycle-based fatigue monitoring under the Metal Fatigue of Reactor Coolant Pressure Boundary Program in accordance with 10 CFR 54.21(c)(1)(iii). All transients and revised cycle limits used for the fatigue evaluation will be included in the Metal Fatigue of Reactor Coolant Pressure Boundary Program.

4.3.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2, pursuant to 10 CFR 54.21(c)(1)(ii), to verify that the analyses have been projected to the period of the extended operation.

In its review, the staff noticed a footnote for LRA Table 4.3-8 states that the results for the pressurizer surge line hot leg nozzle safe end and for the charging system nozzle were from stress-based fatigue usage calculation. During the audit, the staff confirmed that "stress-based fatigue usage calculation" meant fatigue usage evaluations were performed by EPRI owned software named FatiguePro. The staff notes that FatiguePro takes a simplified approach in the fatigue usage calculation, and does not take all six stress components into consideration. The staff notes that FatiguePro is not endorsed by NC staff as it does not produce the six individual stress components needed to support the ASME Code Section III fatigue analysis method. Therefore, the staff issued RAI 4.3.1.1-1 in a letter dated December 10, 2008. In this RAI, the staff asked the applicant why simplified transient fatigue evlauation methodology is still being used. In a letter dated January 9, 2009, the applicant provided its response to this RAI as well as a commitment (Commitment No. 36) to perform Code compliant fatigue calculations stated in the response. In this response, the applicant stated that ASME Code (Subsection NB) compliant fatigue calculations are in process for these two locations and the revised CUFs results (unadjusted and adjusted for environmental effects) will be reported as an amendment to the PINGP LRA. The commitment was completed and provided to the staff by letter dated April 28, 2009.

In SER Section 4.3.1.1.2, the staff provided the complete detail on RAI 4.3.1.1-1 applicant response to this RAI, and the staff evaluation of the response. On April 28, 2009, the applicant provided the result of the revised fatigue analysis in a letter titled "Supplemental Information Closing License Renewal Commitment Number 36 Regarding Application for Renewed Operating Licenses,"

In reviewing the April 28, 2009 letter, the staff determined several areas that need clarification. In a teleconference on May 4, 2009, the applicant agreed to supplement the LRA to provide additional details to support staff review of the revised fatigue analysis as described below:

(a) On Page 2 of April 28, 2009 letter, several paragraphs under the subsection titled "Determination of Fatigue Usage Unadjusted for Environmental Effects," under Section 4.3.3, describes the transients used for the Safety injection accumulator nozzle, charging nozzle, and PZR surge line hot leg nozzle. The staff noted that some of the transients used in fatigue evaluations for these components are not included in LRA Table 4.3-1 (which shows only the bounding NSSS design transients). The non NSSS design transients are the following:

"inadvertent RCS depressurization, inadvertent auxiliary spray actuation, control rod drop, excessive feedwater flow, RCS refueling, OBE, inadvertent accumulator blowdown, RHR operation during plant cooldown, high head safety injection"

The staff requested the applicant to specify the number of design cycles for the non NSSS design transients listed above as well as the cycles most recently accrued and the cycles projected for 60 years. In addition, the staff also requested the applicant to confirm that **all** transients (including those listed above) used for the fatigue analysis have been tracked and monitored since the plant startup and tracking for all transients that may contribute fatigue usage will be continued during the period of extended operation.

In its letter dated May 8, 2009, the applicant supplemented the LRA with the information the staff requested. In the letter, the applicant stated that the transients asked by the staff were taken from the Westinghouse System Standard for applicable components. For each of these transients, the number of cycles used for fatigue analyses were based on the occurrences accrued to 02/26/2007, projected to 60 years. Based on its review, the staff found the transmitted data reasonable and the concern was resolved.

(b) On Page 3 of April 28, 2009 letter, the top paragraph states "… charging/letdown system flow shutoff and flow change transients were defined based on a standard set of Westinghouse design transients for auxiliary systems, as modified for the expected number of occurrences at 60 years…"

The staff requested the applicant to provide basis for making the cycle modification on the flow shutoff and the flow change transients and specify the actual cycles used for the analysis.

In its letter dated May 8, 2009, the applicant supplemented the LRA with the information the staff requested. In the letter, the applicant listed the 60-year projected cycles. Based on its review, the staff found the transmitted data reasonable and the concern was resolved.

Therefore, the staff found the revised analyses acceptable because they were performed in accordance with the ASME Section III NB-3200 guidelines, using all six stress components, and have accounted for the effects of insurge/outsurge and thermal stratification. Thus, the staff determined that the applicant successfully fulfilled Commitment No. 36.

In its review, the staff noticed that in the calculation of F_{en} for the low alloy steels, the applicant assumes that the dissolved oxygen level for pressurized-water reactor plants is below 0.05 ppm at temperatures above 150 ^{o}C. The staff notes that this assumption in effect takes away the dependency of F_{en} on strain rate and sulfur content, and weakens the dependency of F_{en} on temperature. Therefore, the staff issued RAI 4.3.3-2, in a letter dated December 10, 2008, requesting the applicant to justify this assumption.

In its response to RAI 4.3.3-2, dated January 9, 2009, the applicant states that at PINGP, RCS temperatures above 150 ^{o}C (302 ^{o}F) correspond to operation in Mode 4 (Hot Shutdown, 350 ^{o}F > Tavg > 200 ^{o}F), Mode 3 (Hot Standby, Tavg > 350 ^{o}F), Mode 2 (Startup), or Mode 1 (Power Operation). The applicant states that PINGP controls oxygen in the Reactor Coolant System (RCS) by maintaining a hydrogen overpressure in the Volume Control Tank. The applicant also states that minimum primary water hydrogen levels are maintained which are effective in mitigating oxidizing conditions due to radiolysis or oxygen ingress into the reactor coolant.

The applicant states that the control parameters for RCS dissolved oxygen are in accordance with the PINGP Water Chemistry Program and the PINGP Technical Requirements Manual (TRM) which specify a dissolved oxygen action level limit of less than 100 ppb in Modes 1, 2, 3, and Mode 4 with RCS temperature > 250 ^{o}F. The applicant states that per the TRM, if the limit is exceeded, the dissolved oxygen shall be restored to less than 100 ppb within a 24-hour period or the Unit shall be shutdown. The applicant states that at PINGP, dissolved oxygen in the RCS is typically less than 5 ppb prior to criticality (Modes 2, 3, and 4). The applicant further states that a review of PINGP RCS water chemistry data from 1999-2008 was performed and has confirmed that the dissolved oxygen content in the RCS never exceeded 40 ppb (0.04 ppm) when the RCS temperature was greater than 300 ^{o}F.

On the basis of its review, the staff found the applicant's assumption that a dissolved oxygen level below 0.05 ppm is reasonable because it is supported by the past plant operating records. Based on the assumed dissolved oxygen level of 0.05 ppm, the applicant correctly obtained the value of the EAF correction factor, F_{en} = 2.455, for low alloy steel locations. Thus, the staff finds the applicant resolved the concern stated in RAI 4.3.3-2.

The LRA states that the bounding F_{en} value was used for all stainless steel locations. The staff determined that statement is misleading because according to NUREG/CR-5704, the bounding F_{en} value for the austenitic stainless steels is 15.35 but a F_{en} value of 2.55 was used in the LRA for the RHR Tee. In a teleconference held on February 10, 2009, the staff requested the applicant to clarify. In this teleconference, the applicant replied that the F_{en} for the RHR Tee was calculated based on the maximum temperature at the RHR heat exchanger, 350 ^{o}F (the applicant indicated that this piece of information is documented in PINGP UFSAR Section 10.2.4.2). The staff notes that for austenitic stainless steels, 200 ^{o}C (392 ^{o}F) is a threshold level, below which the F_{en} is independent of the strain rate or the dissolved oxygen level. At a temperature of 350 ^{o}F, which is below 392 ^{o}F, the F_{en} for the RHR Tee can be readily calculated as 2.55, the value listed in LRA Table 4.3-8. With such a clarification, the staff found that the applicant appropriately handled the F_{en} for the RHR Tee, so the staff's concern was resolved.

The staff notes that F_{en} values for all locations are listed in the revised LRA Table 4.3-8 transmitted via NSPM letter dated April 28, 2009. The applicant states that for the charging and the surge line hot leg nozzles, the F_{en} was individually determined for each load set pair using

Integrated Strain Rate approach shown in MRP-47 (EPRI report). The staff notes that MRP-47 uses the same F_{en} equations as those shown in NUREG/CR-5704 for austenitic stainless steels and NUREG/CR-6583 for carbon steels and low-alloy steels. The Integrated Strain Rate approach shown in MRP-47 is similar to the approach used in NUREG/CR-6909, which adopts the research results of Nakamura, T., M. Higuchi, T. Kusunoki, and Y. Sugie, documented in "JSME Codes on Environmental Fatigue Evaluation," Proc. of the 2006 ASME Pressure Vessels and Piping Conf., July 23–27, 2006, Vancouver, BC, Canada, paper # PVP2006–ICPVT11–93305.

The applicant indicates that the F_{en} value shown in the revised LRA Table 4.3-8 is an "effective" overall F_{en} multiplier, which was back-calculated by dividing the total environmentally-adjusted CUF (sum of the adjusted usage factors from each load set pair) by the total unadjusted CUF (sum of the unadjusted usage factors from each load set pair).

On the basis of its review, the staff found the EAF analyses are acceptable because the applicant has followed the guidelines given in NUREG/CR-6583 and NUREG/CR-5704. Individually calculated contribution from each load set pair for the unadjusted CUF and the corresponding F_{en} remove the unnecessary conservatism while accumulating share of partial fatigue damage due to each load set pair under consideration. The staff found this approach acceptable because it does not lose counts of possible contribution from any load set pair.
On the basis of its review of Section 4.3.3, the staff found the applicant's claim that the environmentally-adjusted fatigue factor (CUF_{en}) for all six NUREG/CR-6260 locations have been projected valid to the end of the period of extended operation, consistent with 10 CFR 54.21(c)(1)(ii). The projected (CUF_{en}) are acceptable because the values are all within the limit of 1.0 for 60 years. In addition, the applicant stated that the EAF for the NUREG/CR-6260 locations will be managed during the period of extended operation using cycle counting in accordance with 10 CFR 54.21(c)(1)(iii). The staff found this provides additional assurance and is consistent with the GALL Report.

4.3.3.3 UFSAR Supplement

LRA Section A4.2 summarizes the transients data, including transient names, types, design cycles and 60-year projections, and concluded that the CUF_{en} for the Class 1 components with environmental effects on fatigue based on those transients will remain valid for the period of the extended operation.

On the basis of the review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue analyses for Class 1 components involving environmental effects fatigue is adequate.

4.3.3.4 Conclusion

Based on its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), the TLAA on the EAF for the NUREG/CR-6260 components have been projected valid to the end of the period of extended operation. The staff also concludes that license renewal Commitment 36 is fulfilled and can be closed.

In addition, the staff concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electric Equipment

The applicant's 10 CFR 50.49 Environmental Qualification (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 instrumentational and control (I&C) components that are important to safety and are located in a harsh environment. The harsh environments of the plant are those areas subject to environmental effects by loss-of-coolant accidents or high-energy line breaks. EQ equipment comprises safety-related and Q-list equipment, nonsafety-related equipment, whose failure 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, that: (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 applicant's evaluation of EQ of electrical equipment for the period of extended operation. The applicant evaluated EQ electrical components using 10 CFR 50.49(f) qualification methods. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered TLAAs for license renewal.

The applicant stated that when qualification time limits are approached, whether during the initial 40-year license term or the period of extended operation, the program requires replacement, refurbishment, or reanalysis to extend the qualification of the component under 10 CFR 50.49(e)(5). The applicant also stated that reanalysis is an acceptable alternate for extending the qualified life of an EQ component. Important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria and corrective actions (if acceptance criteria are not met).

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 equipment 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 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 delineated in 10 CFR 50.49.

The staff conducted an audit of the information provided in Section B3.1 of the LRA 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 the GALL program X.E1, “Environment Qualification of Electrical Components,” is consistent with 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 A3.1, the applicant provided the UFSAR supplement containing a summary description of environmental qualification of electrical equipment. This summary description is not consistent with that in Table 4.4.2 of SRP-LR as it does not contain reanalysis attributes. Reanalysis must address 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 prior to the end of qualified life when the reanalysis will be completed. In a letter dated November 5, 2008, the staff issued RAI B.3.1-3, requesting the applicant to revise the UFSAR supplement description to include these reanalysis attributes. In response to the staff’s request. In a letter dated December 5, 2008, the applicant revised LRA Section A3.1, Environmental Qualification of Electrical Components program, on Page A-17 the following paragraph was added to the end of the existing program description, to read as follows:

> “Reanalysis is an acceptable alternative for extending the qualified life of an EQ component. Important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria and corrective actions (if acceptance criteria are not met.”

The reanalysis is required when qualification time limits are approached, whether during the initial 40-year license term or the period of extended operation.

The staff finds the applicant’s response acceptable because the information in the UFSAR supplement, as supplemented by the information in the applicant’s response to RAI B3.1-3, is an adequate summary description of the program, as required by 10 CFR 54.21(d), and this summary description is consistent with that in Table 4.4.2 of SRP-LR.

4.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that, for environmental qualification of electrical equipment, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation, pursuant to 10 CFR 54.21(c)(1)(iii). The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 <u>Concrete Containment Tendon Prestress Analyses</u>

4.5.1 Summary of Technical Information in the Application

LRA Section 4.5 summarizes the evaluation of concrete containment tendon prestress for the period of extended operation. The LRA states that Units 1 and 2 containment have no prestressed tendons.

4.5.2 Staff Evaluation

Units 1 and 2 containments 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 have no prestressed tendons in their containment buildings.

4.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes this TLAA is not required.

4.6 <u>Containment and Penetration Fatigue Analyses</u>

4.6.1 Reactor Containment Vessel Fatigue

4.6.1.1 Summary of Technical Information in the Application

LRA Section 4.6.1 summarizes the evaluation of the primary containment for each unit, which consists of a cylindrical steel pressure vessel and is referred to as the Reactor Containment Vessel (RCV). The function of the RCV is to confine radioactive materials that could be released by accidental loss of integrity of the Reactor Coolant System pressure boundary. The LRA further states that the RCV is completely enclosed within the concrete Shield Building. A five-foot annular space is provided between the RCV and the shield building.

LRA Section 4.6.1 stated that the RCV design included an analysis which determined that a cyclical fatigue analysis was not required, per ASME Code Section III, Subsection B, Paragraph N-415.1. The original design assumed 40 cycles of vessel pressurization from atmospheric to design pressure. The LRA further states that this condition will only occur during integrated leak rate tests, which are performed on a 10-year basis, or during an accident. Therefore the 40-cycle limit is conservative and will remain valid during the period of extended operation. The original design also specified the number of temperature variations from 50 ºF to 120 ºF as 200 cycles. LRA Table 4.3-1 indicates 126 heatup and 124 cooldown occurrences for a 60-year span; therefore, the applicant said the assumption will remain valid during the period of extended operation. The applicant further stated that these results demonstrate that the exemption from fatigue analysis will remain valid for the period of extended operation. Therefore, the applicant stated that RCV fatigue TLAA has been dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

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 will remain valid for the period of extended operation. The staff reviewed UFSAR Table 4.1-8 and verified that the original plant design was for 200 heatup and cooldown cycles. The staff found that the projected thermal cycles of 126 will remain below the original design value. The staff also found that the projected number of pressurizations is less than the design value of 40 cycles. Since the number of projected cycles remains below the original design assumptions, the staff finds the existing exemption from fatigue analysis for the RCV will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.6.1.3 UFSAR Supplement

The applicant also provided an UFSAR supplement summary description of its TLAA evaluation of the RCV fatigue in LRA Section A.4.4. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the RCV fatigue is adequate because the applicant has provided information equivalent to that in Table 4.6-1 of SRP-LR Section 4.6.

4.6.1.4 Conclusion

On the basis of its review, as previously discussed, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for the RCV fatigue TLAA, the analyses of both Units' RCVs remain valid through the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Containment Penetration Fatigue

4.6.2.1 Summary of Technical Information in the Application

LRA Section 4.6.2 summarizes the evaluation of containment penetration fatigue analysis for the period of extended operation. The LRA states that hot piping penetration assemblies were designed in accordance with USAS B31.1.0-67 which begins to decrease code allowable stresses when thermal cycles become greater than 7,000. The penetrations designed as hot piping penetrations (> 250ºF) are discussed in LRA Section 4.3.2. The LRA states the evaluation indicates that 7,000 thermal cycles will not be exceeded during the period of extended operation for any of the hot penetrations. Therefore, the applicant stated that this TLAA will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

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 will remain valid for the period of extended operation. During its review, the staff verified that the hot piping penetration thermal cycles correlate to the RCS thermal cycles, including reactor trips. Per UFSAR Table 4.1-8, the original design thermal cycles for the RCS are 200, and the original design number of reactor trips is 400. The 60-year projected cycles by the applicant are 126 for heatup, 124 for cooldown, and 168 for reactor trips. These values bound the number of thermal cycles for the containment penetrations and will not exceed the 7,000 limit during the period of extended operation. Since the number of applicable design transients and the number of predicted transients remain below the code allowable limit of 7,000, the staff finds that the TLAA will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.6.2.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of the TLAA evaluation of the containment penetration fatigue in LRA Section A.4.4. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the containment penetration fatigue is adequate because the applicant has provided information equivalent to that in Table 4.6-1 of SRP-LR Section 4.6.

4.6.2.4 Conclusion

On the basis of its review, as previously discussed, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for the containment penetration fatigue TLAA, the analyses remain valid through the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Other Plant-Specific TLAA

LRA Section 4.7 summarizes the evaluation of the following plant-specific TLAAs:

- RCS piping leak-before-break analyses
- reactor vessel underclad cracking
- reactor coolant pump flywheel
- fatigue analysis of cranes
- probability of damage to safeguards equipment from turbine missiles

4.7.1 RCS Piping Leak-Before-Break Analyses

4.7.1.1 Summary of Technical Information in the Application

The applicant evaluated postulated flaw growth as part of its original leak-before-break (LBB) analyses. These analyses consider the thermal aging of the cast austenitic stainless steel (CASS) piping and fatigue transients that cause the postulated flaw to grow during the operating life of the plant. These two analyses (thermal aging of the CASS and fatigue crack growth) could be influenced by time. Therefore, the applicant identified LBB analyses as potential TLAAs for PINGP, Units 1 and 2.

In 1984, the applicant performed LBB analyses for the Unit 1 primary loop piping. In 1991, the applicant performed LBB analyses for the Unit 1 pressurizer surge line. The results of the LBB analyses are documented in reports, WCAP-10640-NP and WCAP-10639-P (-NP is the nonproprietary version and -P is the proprietary version) for the primary coolant piping and WCAP-12876-NP and WCAP-12877-P for the pressurizer surge line. WCAP-10640-NP established the methodology to evaluate thermal aging fracture toughness properties for LBB analyses of CASS in the primary loop fittings. The pipe straight sections are made from forgings. The NRC approved the application of the LBB methodology to PINGP Unit 1 primary loop piping in 1986. The NRC approved the Unit 1 surge line LBB analysis in September 1992. The applicant included the time-related assumptions in the thermal aging of CASS large bore main coolant piping and in the fatigue crack growth analyses of both large bore primary coolant piping and the surge line.

In 1986, the applicant performed LBB analyses for the Unit 2 primary loop piping. The results of the analyses are documented in WCAP-10928-NP for the main coolant piping. WCAP-10928-NP established the methodology to evaluate thermal aging fracture toughness properties for LBB analyses of CASS in the primary loop pipe and fittings. The NRC approved the application of the LBB methodology to PINGP Unit 2 in 1986. The time-related assumptions include the following two analysis considerations: the thermal aging of CASS and the fatigue crack growth analysis.

The first analysis consideration in WCAP-10640-NP and WCAP-10928-NP that could be influenced by plant operating time is the material properties of CASS used in the pipe fittings. Thermal aging causes an elevation in the yield strength of CASS and a decrease in fracture toughness, the decrease being proportional to the level of ferrite in the material. Thermal aging in CASS will continue until a saturation or fully aged point is reached. WCAP-10640-NP, WCAP-10928-NP, and WCAP-10930-NP address the fracture toughness properties of statically cast CF8M stainless steel. Specifically, fully aged fracture toughness values were used to conservatively calculate the JIC values for the cast pipe and fittings. The applicant stated that as the LBB evaluations for both Units use fully aged fracture toughness properties, the thermal embrittlement analyses do not have a material property time-dependency and are not considered TLAAs.

The second analysis consideration that could be influenced by time is the accumulation of actual fatigue transient cycles used in WCAP-10640-NP, WCAP-12876-NP, and WCAP-10928-NP. The applicant developed fatigue crack growth rate laws in a PWR environment based on available industry literature. The applicant evaluated the crack growth for all normal, upset, and test reactor vessel fatigue transients. The applicant noted that these design transients have not been changed or increased for license renewal as discussed in Section 4.3 of the LRA.

4.7.1.2 Staff Evaluation

Pursuant to 10 CFR 54.21(c)(1)(i), the staff reviewed LRA Section 4.7.1 to verify that the LBB analyses for the main coolant loop piping remain valid for the period of extended operation. Pursuant to 10 CFR 54.21(c)(1)(iii), the staff verified that the effects of aging on the intended function of the main coolant piping will be adequately managed for the period of extended operation.

The TLAA concerns are thermal aging of the CASS material and fatigue crack growth analyses of the subject piping because these two issues are time-dependent. By letter dated November 20, 2008, the staff raised issues related to the applicant's TLAA of the LBB analyses in LRA Section 4.7.1 and requested additional information. By letter dated December 11, 2008, the applicant provided its response to the staff's RAI on Section 4.7.1. The technical issues related to the TLAA evaluation of the LBB analyses are as follows.

In response to RAI 4.7.1-1, the applicant provided the inspection history of the piping that has been approved for LBB at PINGP Units 1 and 2. The applicant stated that the primary loop piping in both units and the pressurizer surge line piping in Unit 1 and associated nozzle welds have been periodically examined in accordance with the requirements of ASME Code Section XI. The applicant used surface and volumetric inspection techniques since the beginning of the third inservice inspection interval, which began on December 17, 1993 for Unit 1 and on December 21, 1994 for Unit 2. The applicant reported that based on surface examination, some minor surface indications (e.g., small rounded and linear indications) were identified on the RCS piping. These indications were evaluated and dispositioned per the requirements of ASME Code Section XI. Some indications were removed (e.g., by light buffing), while others were found acceptable per the ASME Code, Section XI, and left in place. A review of the volumetric examination results found that some geometric indications were identified but no volumetric indications required corrective action or repair/replacement.

The RCS piping is currently subject to examination in accordance with ASME Code Section XI, 1998 Edition, including the 1998, 1999, and 2000 Addenda, and the approved Risk Informed Inservice Inspection (RI-ISI) Program. These examinations will continue until the end of the current (fourth) inspection interval. Under the current inspection program, the associated piping and nozzle welds are volumetrically examined. Following completion of the current inspection interval, the PINGP aging management program (AMP), ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, will be updated as required by 10 CFR 50.55a, and examinations will be conducted accordingly. The staff finds that the applicant has followed and will follow the requirements of ASME Code, Section XI and 10 CFR 50.55a in performing examinations of LBB piping. Therefore, the staff finds the inspection program of the LBB piping at PINGP Units 1 and 2 is acceptable.

In response to RAI 4.7.1-2, the applicant clarified that the Unit 1 large bore primary coolant piping fittings (elbows) are fabricated from CASS (i.e., American Society for Testing and Materials (ASTM) A351). The Unit 1 large bore primary coolant piping straight sections are made from forgings (i.e., ASTM A376). All Unit 2 large bore primary coolant piping fittings and straight sections are fabricated from CASS (i.e., ASTM A351). The Units 1 and 2 pressurizer surge line piping fittings and straight sections are fabricated from forged product forms (i.e., ASTM A376, A403). Also, in response to RAI 4.7.1-3, the applicant clarified that that LBB technology has not been implemented and LBB analyses have not been submitted to the NRC for the PINGP Unit 2 pressurizer surge line.

In RAI 4.7.1-4, the staff noted that Nickel-based Alloy 600/82/182 material in the PWR environment has been shown to be susceptible to primary water stress corrosion cracking (PWSCC). The staff asked the applicant to identify any Units 1 and 2 LBB piping which contain Alloy 82/182 weld metal and Alloy 600 components, to discuss any mitigation measures (such as weld overlays or mechanical stress improvement) that have been or will be implemented to reduce the effects of PWSCC on the LBB piping components, and to discuss the inspection history and future inspection frequency of the Alloy 81/182 dissimilar metal butt welds.

In response to RAI 4.7.1-4, the applicant stated that PINGP has no LBB piping which contains Alloy 82/182 weld metal or Alloy 600 components. The applicant noted that the Unit 2 pressurizer surge nozzle-to-safe end dissimilar metal weld is constructed of Alloy 82; however, this piping has not been approved for LBB.

To mitigate the effects of PWSCC on the Unit 2 pressurizer surge nozzle weld, a full structural weld overlay (FSWOL) on the pressurizer surge nozzle-to-safe end dissimilar metal and safe end-to-reducer stainless steel butt welds was recently installed during the PINGP Unit 2 refueling outage (2R25). The NRC authorized the installation of the FSWOL in a letter dated June 15, 2008 [ADAMS Accession No. ML081360646].

The applicant ultrasonically examined the PINGP Unit 2 pressurizer surge nozzle-to-safe end weld in November 2006 per ASME Code Section XI, Appendix VIII, Supplement 10. The examination met the ASME Code Section XI and EPRI MRP-139, "Primary System Piping Butt Weld Inspection and Evaluation Guidelines" requirements for examination coverage. No PWSCC indications were detected.

The applicant also ultrasonically examined the Unit 2 surge nozzle-to-safe end dissimilar metal weld in September 2008, prior to installation of the full structural weld overlay (FSWOL). The examinations were performed in accordance with the qualification requirements of ASME Code Section XI, Appendix VIII, Supplement 10. No recordable indications were identified.

In October 2008, following installation of the FSWOL, the applicant ultrasonically examined the new overlay weld and the nozzle-to-safe end dissimilar metal weld. One hundred percent of the Code required volume was inspected during the examinations. The ultrasonic test (UT) resulted in no recordable indications.

Although the Unit 2 surge line has not been approved for LBB application and, therefore, is not part of the TLAA evaluation, the staff notes that the applicant has mitigated the potential for PWSCC of the nozzle-to-safe end dissimilar metal weld with a weld overlay. The applicant has inspected the subject weld in accordance with the NRC approved Alternative Request 2-RR-4-8. Therefore, the issue of PWSCC of the Alloy 82/182 dissimilar metal welds is closed.

In RAI 4.7.1-5, the staff stated that the applicant discusses AMP B2.1.39, Thermal Aging Embrittlement of CASS, in Appendix B of the LRA. However, Section 4.7.1 of the LRA does not mention this AMP to manage the LBB piping that is made of CASS. The staff asked the applicant to discuss how CASS material of the LBB piping will be managed because AMP B.2.1.41 does not seem to be used to monitor the CASS components in the LBB piping systems for thermal aging embrittlement.

In response to RAI 4.7.1-5, the applicant stated that as specified in PINGP LRA Table 3.1.2-2, the Thermal Aging Embrittlement of CASS Program manages reduction of fracture toughness due to thermal aging embrittlement of CASS piping and fittings in the RCS piping. This is consistent with NUREG-1801, Line Item IV.C2-4. The Unit 1 and 2 RCS piping and fittings constructed of ASTM A351, CF8M material, are included in the scope of AMP B2.1.39.

The staff finds that the applicant does use AMP B2.1.39, Thermal Aging Embrittlement of CASS Program, which is consistent with the same program in NUREG-1801, to monitor the CASS components in the LBB piping system. Therefore, this issue is closed. The discussion below provides more details on the CASS component program.

In RAI 4.7.1-6, the staff noted that by letter dated May 19, 2000, the NRC forwarded to the Nuclear Energy Institute an evaluation of thermal aging embrittlement of CASS components [ADAMS Accession No. ML003717179]. In the NRC’s evaluation, the staff provided its positions on aging management of CASS components. The staff asked the applicant to address how the CASS components in the LBB piping at both units satisfy the staff positions in its evaluation dated May 19, 2000.

In response to RAI 4.7.1-6, the applicant stated that as described in its May 19, 2000 letter, the staff's position on thermal aging embrittlement in primary system CASS components has been incorporated in NUREG-1801, Chapter XI, Program XI.M12, Thermal Aging Embrittlement of CASS. The program includes (a) determination of the susceptibility of CASS components to thermal aging embrittlement, and (b) for potentially susceptible components, aging management is accomplished through either enhanced volumetric examination or plant- or component-specific flaw tolerance evaluation.

As shown in LRA Table 3.1.2-2, PINGP relies on the Thermal Aging Embrittlement of CASS Program to manage the reduction of fracture toughness in CASS RCS piping and fittings. As described in LRA Section B2.1.39, the PINGP Thermal Aging Embrittlement of CASS Program is a new program that will be consistent with the recommendations of NUREG-1801, Chapter XI, Program XI.M12, Thermal Aging Embrittlement of CASS.

The PINGP Thermal Aging Embrittlement of CASS Program scope includes the following CASS piping components which have been approved for LBB:

- Unit 1 large bore primary coolant piping fittings (elbows), which are constructed of statically cast ASTM A351, Type CF8M material
- Unit 2 large bore primary coolant piping (straight sections), which is constructed of centrifugally cast ASTM A351, Type CF8M material
- Unit 2 large bore primary coolant piping fittings (elbows), which are constructed of statically cast ASTM A351, Type CF8M material

The PINGP Thermal Aging Embrittlement of CASS Program includes a determination of the susceptibility of CASS components to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. After applying the screening criteria specified in Section 3 of the May 19, 2000 letter and NUREG-1801, XI.M12, Element 1, the following CASS components, in the scope of the CASS aging management program, were determined to be potentially susceptible to thermal aging embrittlement:

A segment of straight RCS piping is potentially susceptible to thermal aging embrittlement due to its high molybdenum content and ferrite content which exceeds 20 percent by weight:

Unit 2 RCS 27.5-inch inside diameter cold leg piping in Loop A, Heat Number C-1737

The following RCS fittings are potentially susceptible to thermal aging embrittlement due to their high molybdenum content and ferrite content which exceeds 14 percent by weight:

- Unit 1 RCS 27.5-inch inside diameter, 35 degree Elbow, Heat No. 33676
- Unit 1 RCS 31.0-inch inside diameter, 90 degree Elbow w/Splitter, Heat No. 13704
- Unit 1 RCS 31.0-inch inside diameter, 90 degree Elbow w/Splitter, Heat No. 19114
- Unit 2 RCS 27.5-inch inside diameter, 35 degree Elbow, Heat No. 37758-2

- Unit 2 RCS 31.0-inch inside diameter, 40 degree Elbow, Heat No. 38992-3
- Unit 2 RCS 31.0-inch inside diameter, 90 degree Elbow, Heat No. 392312

For the CASS components determined to be potentially susceptible to thermal aging embrittlement, in accordance with criteria specified in Section 3.0 of the May 19, 2000 letter and in NUREG-1801, XI.M12, Elements 3 and 4, the PINGP CASS aging management program will provide enhanced volumetric examinations to detect and size cracks, or component-specific flaw tolerance evaluations will be performed. The PINGP CASS aging management program will provide enhanced volumetric examinations on the base metal determined to be limiting due to applied stress, operating time, and environmental considerations, using examination methods that meet the criteria of ASME Code Section XI, Appendix VIII. Alternatively, component-specific flaw tolerance evaluations will be performed using specific geometry and applied stress to demonstrate that the thermally-embrittled material has adequate toughness.
Per NUREG-1801, XI.M12, Element 5, the PINGP CASS Program will incorporate the inspection schedule of IWB-2400 or IWC-2400 for potentially susceptible CASS components using ASME examination methods for the detection of cracking. Alternatively, component-specific flaw tolerance evaluations will be performed. Consistent with the criteria specified in Section 3.0 of the May 19, 2000 letter and in NUREG-1801, XI.M12, Element 6, flaws detected in CASS components will be evaluated in accordance with the applicable procedures of IWB-3500 or IWC-3500 in Section XI of the ASME Code. Alternatively, flaw tolerance evaluation for components with ferrite content up to 25 percent will be performed according to the principles associated with IWB-3640 procedures for submerged arc welds disregarding the ASME Code restriction of 20 percent ferrite in IWB-3641(b)(1). PINGP does not have RCS CASS piping with greater than 25 percent ferrite. Per NUREG-1801, XI.M12, Element 7, repair and replacement of CASS components will be performed in accordance with the requirements of ASME Code Section XI, Subsection IWA-4000.

The staff finds that the applicant's Thermal Aging Embrittlement of CASS Program is consistent with the staff's guidance in its May 19, 2000 letter and NUREG-1801. Therefore, the applicant's management of the thermal aging of the CASS component is acceptable.

In RAI 4.7.1-7, the staff asked the applicant whether the current fatigue crack growth analyses are performed for 60 years. In response to RAI 4.7.1-7, the applicant clarified that as reported in Section 6.0 of WCAP-10640-NP and WCAP-10639-P (for Unit 1) and WCAP-10928-NP and WCAP-10929-P (for Unit 2), the purpose of the fatigue crack growth analyses for the primary coolant loop piping was to determine the sensitivity of the piping to the presence of small cracks. For the Unit 1 and Unit 2 large primary loop piping, a finite element stress analysis was completed for one of the highest-stressed cross sections of a plant typical in geometry and operational characteristics to any Westinghouse PWR system, such as PINGP Units 1 and 2. Crack growths calculated in the selected region are representative of the entire primary loop. All normal, upset, and test conditions were considered, and circumferentially oriented surface flaws were postulated in the region, assuming the flaw was located in three different locations of the pipe. Fatigue crack growth rate laws were used. The results of fatigue crack growth at 40 years for semi-elliptical surface flaws of circumferential orientation and various depths show that crack growth is very small at all three locations.

The TLAAs associated with the fatigue crack growth analyses are the normal, upset, and test conditions (i.e., NSSS design transients) that were used to calculate fatigue crack growth at 40 years. These design transients have not been changed or increased for license renewal as discussed in Section 4.3 of the PINGP LRA. The existing numbers of thermal and loading cycles for each transient remain valid for 60 years of plant operation. Therefore, the fatigue crack growth calculations reported in WCAP-10640-NP and WCAP-10639-P (Unit 1) and WCAP-10928-NP and WCAP-10929-P (Unit 2) remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

As reported in Section 6.0 of WCAP-12876-NP and WCAP-12877-P, the purpose of the fatigue crack growth analyses for the PINGP Unit 1 pressurizer surge line was to determine the sensitivity of the pressurizer surge line to the presence of small cracks when subjected to the transients discussed in WCAP-12839, “Structural Evaluation of Prairie Island Unit 1 Pressurizer Surge Line, Considering the Effects of Thermal Stratification.”

For the Unit 1 pressurizer surge line, fatigue crack growth analyses were performed at two locations where detailed fracture mechanics evaluations were completed: (1) surge line piping near the reactor coolant hot leg nozzle, and (2) surge line piping near the pressurizer surge nozzle. Various initial semi-elliptical surface flaws with a six-to-one aspect ratio were assumed to exist. The largest initial flaw assumed was one with a depth equal to 10 percent of the nominal wall thickness. A fatigue crack growth law for austenitic stainless steel in a PWR environment was developed and used in the crack growth analyses. The results of fatigue crack growth at 40 years for an initial flaw of 10 percent nominal wall thickness show that crack growth is very small at both locations.

The TLAAs associated with the fatigue crack growth analyses are the normal, upset, and test conditions (i.e., NSSS design transients) and pressurizer surge line transient subevents (to reflect stratification effects) presented in WCAP-12839 that were used to calculate fatigue crack growth at 40 years. The NSSS design transients and pressurizer surge line subevents have not been changed or increased for license renewal as discussed in Section 4.3 of the PINGP LRA. The existing numbers of thermal and loading cycles for each transient remain valid for 60 years of plant operation. Therefore, the fatigue crack growth calculations reported in WCAP-12876-NP and WCAP-12877-P remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

The staff finds that although the fatigue crack growth for primary loop piping and surge line piping was calculated based on 40 years of transients, the transient cycles used in the analysis bound 60 years of operation. Therefore, the applicant’s fatigue crack growth calculations are acceptable for the extended period of operation.

As part of fatigue crack growth calculations, the staff asked the applicant, in RAI 4.7.1-8, whether the Unit 1 pressurizer surge line has experienced temperature transients in which temperature differences exceeded the design transients used in the LBB analyses. In response to RAI 4.7.1-8, the applicant stated that in accordance with Section 1.1 of WCAP-12876-NP and WCAP-12877-P, the results of the pressurizer surge line thermal stratification evaluation described in WCAP-12839 were used in the LBB analyses of the Unit 1 pressurizer surge line. PINGP monitors thermal stratification in the pressurizer surge line by tracking the maximum temperature differential between the pressurizer water and the RCS (Loop B) hot leg during heatups and cooldowns to ensure compliance with the thermal stratification transients defined in WCAP-12839. There have been no instances in which temperature differences between the pressurizer and RCS have exceeded the design transients defined in WCAP-12839. In addition, the numbers of heatup and cooldown cycles experienced by the surge line are within the cycle limits specified in the analysis. Therefore, there have been no instances where the Unit 1 pressurizer surge line has experienced temperature transients that have exceeded the design transients used in the LBB analyses.

The staff finds that Unit 1 pressurizer surge line has not experienced out-of-limit temperature transients. Therefore, the fatigue crack growth calculation for Unit 1 surge line has not been affected.

4.7.1.3 UFSAR Supplement

In LRA Section A4.5, the applicant summarized its RCS LBB analyses as discussed in UFSAR Sections 4.6.2.3 and 4.6.2.4. The applicant also summarized its TLAA evaluation of the LBB analyses for the Units 1 and 2 primary coolant system piping and Unit 1 pressurizer surge line. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address the TLAA evaluation of the subject piping is adequate.

4.7.1.4 Conclusion

On the basis of its review, the staff concludes that pursuant to 10 CFR 54.21(c)(1)(i), the applicant has demonstrated that the LBB analyses for the Units 1 and 2 primary coolant system piping and Unit 1 pressurizer surge line remains valid for the period of extended operation.

Pursuant to 10 CFR 54.21(c)(1)(iii), the staff concludes that the applicant has demonstrated that the effects of aging on the intended functions of the Units 1 and 2 primary coolant system piping and Unit 1 pressurizer surge line will be adequately managed for the period of extended operation.

The staff concludes further that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation of the Units 1 and 2 primary coolant system piping and Unit 1 pressurizer surge line, as required by 10 CFR 54.21(d).

4.7.2 Reactor Pressure Vessel Underclad Cracking

4.7.2.1 Summary of Technical Information in Application

Section 4.7.2 of the LRA addresses the TLAA of RPV underclad cracking for the extended period of operation. The applicant references topical report WCAP-15338, “A Review of Cracking with Weld Deposited Cladding in Operating PWR Plants,” (Reference 96) which was prepared by the Westinghouse Owners Group (WOG), as the primary analysis for the TLAA of RPV underclad cracking. The applicant further references the SER issued by the staff in September 2002 (Reference 66), which concludes that the analysis presented in WCAP-15338 applies to all Westinghouse plants. The applicant states that the analyses contained in WCAP-15338 can be used to demonstrate that fatigue growth of the subject flaws is insignificant over 60 years of operation and the presence of underclad cracks are of no concern relative to the structural integrity of the RPV. In addition, the applicant states that the action items specified in the NRC issued SER approving WCAP-15338, are satisfied for PINGP Units 1 and 2.

4.7.2.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2 to verify, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis has been projected to the end of the period of extended operation. Intergranular separations (underclad cracking) in low alloy steel heat-affected zones (HAZ) under austenitic stainless steel weld claddings were first identified in 1970 and were reported to occur in only SA-508 Class 2 RPV forgings manufactured to a coarse grain practice and clad by high-heat-input submerged arc processes. This type of underclad cracking is known as reheat cracking due to the cracking resulting from post-weld heat treatment of single-layer austenitic stainless steel cladding that was deposited using high-heat input welding processes. Another type of underclad cracking is identified as cold cracking and has occurred in SA-508 Class 3 forgings after deposition of the second and third layers of austenitic stainless steel cladding, where neither pre-heating nor post-heating was applied during the cladding procedure. The cold cracking was determined to be attributable to residual stresses near the yield strength in the weld metal or base metal interface after cladding deposition, combined with a crack-sensitive microstructure in the HAZ and high levels of diffusible hydrogen in the austenitic stainless steel or Inconel weld metals. Both these types of cracking underneath the RPV cladding are relevant to PINGP, Units 1 and 2. Hence, LRA section 4.7.2 of the PINGP LRA addresses the TLAA of the RPV underclad cracking for the extended period of operation.

WCAP-15338 contains an analysis of underclad cracking and the subsequent growth of these cracks with time in the RPV steel. The WOG concluded that the evaluation contained in this report may be used to demonstrate that fatigue growth of the subject flaws is insignificant over 60 years and the presence of the underclad cracks are of no concern relative to the structural integrity of the RPV. The staff issued a SER dated September 25, 2002 for WCAP-15338 and concluded that Westinghouse's methodology in performing the flaw evaluation is consistent with well-established flaw evaluation procedures and criteria in the ASME Code and, therefore, is adequate. In addition, the staff concluded that any WOG plant may reference WCAP-15338 in a LRA to satisfy the requirements of 10 CFR 54.21(c)(1) for demonstrating the appropriate findings regarding evaluation of TLAA for the RPV components for the period of extended operation.

However, in order for a license renewal applicant to reference the WCAP-15338 report when considering the TLAA of RPV underclad cracking, the applicant must complete the following action items:

- The license renewal applicant is to verify that its plant is bounded by the WCAP-15338 report. Specifically, the renewal applicant is to indicate whether or not the number of design cycles and transients assumed in the WCAP-15338 analysis bounds the number of cycles for 60 years of operation of its RPV.
- Section 54.21(d) of 10 CFR requires that an UFSAR supplement for the facility contains a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those applicants for license renewal referencing the WCAP-15338 report for the RPV components shall ensure that the evaluation of the TLAA is summarily described in the UFSAR supplement.

The applicant has referenced WCAP-15338 in LRA Section 4.7.2 and states that both the above action items pertaining to license renewal TLAA of RPV underclad cracking are satisfied. PINGP is a 2-loop plant, thus for action item 1, the applicant provided the design cycles and transients for PINGP, Units 1 and 2 in Table 4.1-8 of the PINGP UFSAR and LRA Table 4.3-1 and concluded that the number of these design cycles and transients is less than the number of design cycles and transients used in the WCAP-15338 report analysis. However, WCAP-15338 does not explicitly state the number of design cycles and transients used in the analysis. Therefore, the staff issued RAI 4.7.2 in a letter dated November 4, 2008, requesting the applicant to provide the bounding number of design cycles and transients that were used in the WCAP-15338 report analysis. The applicant submitted a response to RAI 4.7.2 in a letter dated November 12, 2008 to the NRC, wherein the applicant provided the number of design cycles and transients that were used in the WCAP-15338 report analysis. Specifically, the applicant stated that the number of design cycles used in the fatigue crack growth evaluation is reported in a table on page 9-10 of WCAP-15338-A, where WCAP-15338-A is the accepted version of the WCAP-15338 report. Based on 60 years of plant operation, the projected number of design cycles and transients expected to be experienced by PINGP, Units 1 and 2 as shown in Table 4.3-1 of the LRA are bounded by the number of design cycles and transients assumed in the WCAP-15388-A analysis as given in the table of page 9-10 of the WCAP-15388-A report. Therefore, the staff confirms that the requirements of action item 1 are satisfied.

For action item 2, PINGP provided a summary description of the RPV underclad cracking TLAA evaluation in its UFSAR supplement, which is contained in Appendix A4.6 of the LRA. Therefore action item 2 above is also satisfied.

4.7.2.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of the RPV underclad cracking in LRA Appendix A4.6. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the RPV underclad cracking TLAA is adequate.

4.7.2.4 Conclusion

Based on the staff's review as discussed in the above evaluation, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the RPV underclad cracking TLAA has been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3 Reactor Coolant Pump Flywheel

4.7.3.1 Summary of Technical Information in Application

Section 4.7.3 of LRA addresses the TLAA of the reactor coolant pump flywheel. Specifically, the applicant has addressed the effect of fatigue crack initiation and growth in the flywheel bore keyway from stresses due to starting the motor. The applicant has referenced the analysis contained in topical report WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination," which evaluates the fatigue crack initiation and growth in reactor coolant pump flywheel for 60 years. The applicant stated that the analysis presented in WCAP-15666 adequately addresses the stress and fracture evaluation pertaining to fatigue crack initiation and growth through the extended period of operation, thus satisfying the reactor coolant pump flywheel TLAA requirements in accordance with 10 CFR 54.21(c)(1)(i).

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 reactor coolant pump flywheel TLAA has been projected to the end of the period of extended operation.

The reactor coolant pump motors are large, vertical, squirrel cage, induction motors. The motors have flywheels to increase rotational-inertia, thus prolonging pump coastdown and assuring a more gradual loss of main coolant flow to the core in the event that the pump power is lost. The flywheel is mounted on the upper end of the rotor, above the upper radial bearing and inside the motor frame. The aging effect of concern is fatigue crack initiation and growth in the flywheel bore keyway from stresses due to starting the motor.

Topical report WCAP-15666 provides analyses of the fatigue crack initiation and growth in the flywheel bore keyway from stresses due to starting the motor. Based on the results of the WCAP-15666 analyses, the fatigue crack growth in the flywheel after 6,000 cycles of the reactor coolant pump (60-year plant life) determined using the approved methodology of ASME Code, Section XI, is negligible (0.08 in) even when assuming a conservative initial crack length of 10 percent through the flywheel. In addition, according to the SER (January 2003) for WCAP-15666, the staff found the pump flywheel conditional failure probability analysis in the report to be fairly conservative in its assumptions of input parameters (pump motor revolutions per minute, number of cycles per year, initial crack length) required to predict critical crack sizes through the extended period of operation and that this probabilistic approach supported the negligible fatigue crack growth analysis previously mentioned. Therefore, the staff finds the fatigue crack growth TLAA for PINGP Units 1 and 2 reactor coolant pump flywheels for the extended period of operation to be acceptable on the basis of the staff's acceptability of the WCAP-15666 analyses.

4.7.3.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of the reactor coolant pump flywheels in LRA Appendix A4.7. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the reactor coolant pump flywheel TLAA is adequate.

4.7.3.4 Conclusion

Based on the staff's review as discussed in the above evaluation, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the reactor coolant pump flywheel TLAA has been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.4 Fatigue Analysis of Cranes

4.7.4.1 Summary of Technical Information in the Application

In LRA Section 4.7.4, the applicant states that the polar cranes, auxiliary building cranes, turbine building cranes, and spent fuel cranes were qualified to Electric Overhead Crane Institute (EOCI) Specification #61 but are in compliance with the design standards of CMAA-70, with limited exceptions. The applicant also states that among the criteria of CMAA-70 is a design load cycle limit of 20,000 cycles and NMC has reviewed these cranes and determined that even very conservative estimates of the number of cycles to be achieved in 60 years of operation do not exceed the 20,000 cycle limit in CMAA-70.

Therefore, the applicant concludes that the crane designs will remain valid for the period of extended operation in accordance with the requirements of 10 CFR 54.21(c)(1)(i).

4.7.4.2 Staff Evaluation

The staff reviewed LRA Section 4.7.4, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of the extended operation.

The staff notes that the fatigue usage of cranes is directly proportional to the number of times the cranes perform load lifting duties. Since the information contained in LRA Section 4.7.4 is insufficient for making a fatigue evaluation, the staff issued RAI 4.7.4-1, in a letter dated December 10, 2008, requesting the applicant to provide an estimate for the number of lifting cycles that have occurred in the polar cranes, auxiliary building cranes, the turbine building cranes, and spent fuel cranes and the 60-year lifting cycle projections for these cranes.

In a letter dated January 09, 2009, NSPM responded to RAI 4.7.4-1 stating that the NUREG-0612 cranes with fatigue TLAAs include the polar cranes, auxiliary building cranes, the turbine building cranes, and spent fuel cranes, and the cranes are described in Section 12.2.12 of the PINGP UFSAR. The applicant states in its response to RAI 4.7.4-1 that Northern States Power Company (NSP) has previously issued a letter to the NRC, dated November 8, 1982, titled "Control of Heavy Loads (Response to Staff Concerns on the Six Month Submittal)," in which it stated that the evaluation of fatigue for the polar cranes, auxiliary building cranes, and turbine building cranes assumed 800 design loading cycles for the heaviest load over 40 years. The applicant stated that the largest actual load and weight (3,700 pounds) for the spent fuel crane is substantially less than the rated crane capacity of 6,000 pounds. The applicant further stated that this assumed loading cycle allows for two outages per year and ten lifts of the heaviest load per outage over 40 years. Multiplying this assumed 800 load cycle by 1.5 to accommodate 60 years of operation yields a projection of 1,200 heavy load cycles through out the period of extended operation, providing significant margin to the design load cycle limit of 20,000 cycles.

The applicant states that as of January 2009, both PINGP Unit 1 and 2 have completed 25 refueling outages. Multiplying 10 lifts of the heaviest load per outage by 25 refueling outages yields an estimate of 250 heavy load cycles to date for the polar cranes and turbine building cranes, and an estimate of 500 heavy load cycles to date for the auxiliary building cranes since they service both units. Based upon the estimated number of heavy lifting cycles accrued to date, it is not expected that these cranes will attain the projected number of lifts (i.e., 1,200) after 60 years of operation.

On the basis of its review, the staff found the applicant has provided the information requested and the staff's concern resolved because the applicant's estimates, 1,200 cycles for any crane over 60 years, are reasonable, with ample margins (greater than 90 percent), to reach the design cycle limit (20,000 cycles). Therefore, the structural integrity of the cranes will be maintained for safe use during the renewed license term.

4.7.4.3 UFSAR Supplement

The applicant provided an UFSAR supplement summary description of its TLAA evaluation of the cranes in LRA Section A4.8. On the basis of its review of the UFSAR supplement, the staff concluded that the summary description of the applicant's actions to address the crane lifting cycle limit issue 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)(i), that, for the crane lifting cycle limit TLAA, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.5 Probability of Damage to Safeguards Equipment from Turbine Missiles

The applicant's basis for deleting LRA Section 4.7.5, Probability of Damage to Safeguards Equipment from Turbine Missiles, is discussed in SER Section 4.1.1.1. The staff's basis for concluding that the Turbine Missile Analysis associated with LRA Section 4.7.5, Probability of Damage to Safeguards Equipment from Turbine Missiles, is not a TLAA for the LRA is discussed in SER Section 4.1.2.1.

4.8 Conclusion for TLAAs

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 regulation.

SECTION 5

REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR Part 54), the Advisory Committee on Reactor Safeguards (ACRS) will review the license renewal application (LRA) for the Prairie Island Nuclear Generating Plant (PINGP), 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. The applicant and the staff from the U.S. Nuclear Regulatory Commission (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 the SER, the full committee will issue a report discussing the results of the review. An update to this SER will include the ACRS report. This update will also include the staff's response to any issues and concerns identified in the ACRS report.

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SECTION 6

CONCLUSION

The staff of the U.S. Nuclear Regulatory Commission (the staff) reviewed the license renewal application (LRA) for the Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, in accordance with the NRC regulations and NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” dated September 2005.
Title 10, Section 54.29, of the *Code of Federal Regulations* (10 CFR 54.29) provides the standards for issuance of a renewed license.

The staff’s conclusion regarding the LRA for PINGP, Units 1 and 2, is withheld pending resolution of the open items described in this SER.

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APPENDIX A

PINGP UNIT 1 AND UNIT 2 LICENSE RENEWAL COMMITMENTS

During the review of the Prairie Island Nuclear Generating Plant (PINGP) Unit 1 and Unit 2, license renewal application (LRA) by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff), 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 1.1 PINGP License Renewal Commitments

APPENDIX A: PINGP LICENSE RENEWAL COMMITMENTS			
Commitment Number	**Commitment**	**FSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**
1	Each year, following the submittal of the PINGP License Renewal Application and at least three months before the scheduled completion of the NRC review, NMC will submit amendments to the PINGP application pursuant to 10 CFR 54.21(b). These revisions will identify any changes to the Current Licensing Basis that materially affect the contents of the License Renewal Application, including the UFSAR supplements.	1.4	12 months after LRA submittal date and at least 3 months before completion of NRC review
2	Following the issuance of the renewed operating license, the summary descriptions of aging management programs and TLAAs provided in Appendix A, and the final list of License Renewal commitments, will be incorporated into the PINGP UFSAR as part of a periodic UFSAR update in accordance with 10 CFR 50.71(e). Other changes to specific sections of the PINGP UFSAR necessary to reflect a renewed operating license will also be addressed at that time.	A1.0	First UFSAR update in accordance with 10 CFR 50.71(e) following issuance of renewed operating licenses
3	An Aboveground Steel Tanks Program will be implemented. Program features will be as described in LRA Section B2.1.2.	B2.1.2	U1 - 8/9/2013 U2 - 10/29/2014
4	Procedures for the conduct of inspections in the External Surfaces Monitoring Program, Structures Monitoring Program, Buried Piping and Tanks Inspection Program, and the RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants Program will be enhanced to include guidance for visual inspections of installed bolting.	B2.1.6	U1 - 8/9/2013 U2 - 10/29/2014
5	A Buried Piping and Tanks Inspection Program will be implemented. Program features will be as described in LRA Section B2.1.8.	B2.1.8	U1 - 8/9/2013 U2 - 10/29/2014

APPENDIX A: PINGP LICENSE RENEWAL COMMITMENTS			
6	The Closed-Cycle Cooling Water System Program will be enhanced to include periodic inspection of accessible surfaces of components serviced by closed-cycle cooling water when the systems or components are opened during scheduled maintenance or surveillance activities. Inspections are performed to identify the presence of aging effects and to confirm the effectiveness of the chemistry controls. Visual inspection of component internals will be used to detect loss of material and heat transfer degradation. Enhanced visual or volumetric examination techniques will be used to detect cracking. [Revised in letter dated 1/20/2009 in response to RAI 3.3.2-13-01]	B2.1.9	U1 - 8/9/2013 U2 - 10/29/2014
7	The Compressed Air Monitoring Program will be enhanced as follows: · Station and Instrument Air System air quality will be monitored and maintained in accordance with the instrument air quality guidance provided in ISA S7.0.01-1996. Particulate testing will be revised to use a particle size methodology as specified in ISA S7.0.01. · The program will incorporate on-line dew point monitoring. [Revised in letter dated 2/6/2009 in response to Region III License Renewal Inspection]	B2.1.10	U1 - 8/9/2013 U2 - 10/29/2014
8	An Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be completed. Program features will be as described in LRA Section B2.1.11.	B2.1.11	U1 - 8/9/2013 U2 - 10/29/2014
9	An Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be implemented. Program features will be as described in LRA Section B2.1.12.	B2.1.12	U1 - 8/9/2013 U2 - 10/29/2014
10	An Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program will be implemented. Program features will be as described in LRA Section B2.1.13.	B2.1.13	U1 - 8/9/2013 U2 - 10/29/2014

APPENDIX A: PINGP LICENSE RENEWAL COMMITMENTS			
11	The External Surfaces Monitoring Program will be enhanced as follows: · The scope of the program will be expanded as necessary to include all metallic and non-metallic components within the scope of License Renewal that require aging management in accordance with this program. · The program will ensure that surfaces that are inaccessible or not readily visible during plant operations will be inspected during refueling outages. · The program will ensure that surfaces that are inaccessible or not readily visible during both plant operations and refueling outages will be inspected at intervals that provide reasonable assurance that aging effects are managed such that the applicable components will perform their intended function during the period of extended operation. · The program will apply physical manipulation techniques, in addition to visual inspection, to detect aging effects in elastomers and plastics. · The program will include acceptance criteria (e.g., threshold values for identified aging effects) to ensure that the need for corrective actions will be identified before a loss of intended functions. · The program will ensure that program documentation such as walkdown records, inspection results, and other records of monitoring and trending activities are auditable and retrievable. [Revised in letter dated 2/6/2009 in response to RAI B2.1.14-1 Follow up question]	B2.1.14	U1 - 8/9/2013 U2 - 10/29/2014
12	The Fire Protection Program will be enhanced to require periodic visual inspection of the fire barrier walls, ceilings, and floors to be performed during walkdowns at least once every refueling cycle. [Revised in letter dated 12/5/2008 in response to RAI B2.1.15-3]	B2.1.15	U1 - 8/9/2013 U2 - 10/29/2014
13	The Fire Water System Program will be enhanced as follows: · The program will be expanded to include eight additional yard fire hydrants in the scope of the annual visual inspection and flushing activities. · The program will require that sprinkler heads that have been in place for 50 years will be replaced or a representative sample of sprinkler heads will be tested using the guidance of NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems" (2002 Edition, Section 5.3.1.1.1). Sample testing, if performed, will continue at a 10-year interval following the initial testing.	B2.1.16	U1 - 8/9/2013 U2 - 10/29/2014

APPENDIX A: PINGP LICENSE RENEWAL COMMITMENTS			
14	The Flux Thimble Tube Inspection Program will be enhanced as follows: - The program will require that the interval between inspections be established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection. - The program will require that re-baselining of the examination frequency be justified using plant-specific wear rate data unless prior plant-specific NRC acceptance for the re-baselining was received. If design changes are made to use more wear-resistant thimble tube materials, sufficient inspections will be conducted at an adequate inspection frequency for the new materials. - The program will require that flux thimble tubes that cannot be inspected must be removed from service.	B2.1.18	U1 - 8/9/2013 U2 - 10/29/2014
15	The Fuel Oil Chemistry Program will be enhanced as follows: · Particulate contamination testing of fuel oil in the eleven fuel oil storage tanks in-scope of License Renewal will be performed, in accordance with ASTM D 6217, on an annual basis. · One-time ultrasonic thickness measurements will be performed at selected tank bottom and piping locations prior to the period of extended operation.	B2.1.19	U1 - 8/9/2013 U2 - 10/29/2014
16	A Fuse Holders Program will be implemented. Program features will be as described in LRA Section B2.1.20.	B2.1.20	U1 - 8/9/2013 U2 - 10/29/2014
17	An Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be implemented. Program features will be as described in LRA Section B2.1.21	B2.1.21	U1 - 8/9/2013 U2 - 10/29/2014
18	An Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will be implemented. Program features will be as described in LRA section B2.1.22. Inspections for stress corrosion cracking will be performed by visual examination with a magnified resolution as described in 10 CFR 50.55a(b)(2)(xxi)(A) or with ultrasonic methods. [Revised in letter dated 2/6/2009 in response to RAI B2.1.22-1 Follow Up question]	B2.1.22	U1 - 8/9/2013 U2 - 10/29/2014
19	The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will be enhanced as follows: · Program implementing procedures will be revised to ensure the components and structures subject to inspection are clearly identified. · Program inspection procedures will be enhanced to include the parameters corrosion and wear where omitted.	B2.1.23	U1 - 8/9/2013 U2 - 10/29/2014
20	A Metal-Enclosed Bus Program will be implemented. Program features will be as described in LRA Section B2.1.26.	B2.1.26	U1 - 8/9/2013 U2 - 10/29/2014

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21	Number Not Used [Deleted by Applicant in a letter Dated 3/27/2009]		
22	Number Not Used [Deleted by Applicant in a letter Dated 3/27/2009]		
23	A One-Time Inspection Program will be completed. Program features will be as described in LRA Section B2.1.29.	B2.1.29	U1 - 8/9/2013 U2 - 10/29/2014
24	A One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program will be completed. Program features will be as described in LRA Section B2.1.30.	B2.1.30	U1 - 8/9/2013 U2 - 10/29/2014
25	For the PWR Vessel Internals Program, PINGP commits to the following activities for managing the aging of reactor vessel internals components: · Participate in the industry programs for investigating and managing aging effects on reactor internals; · Evaluate and implement the results of the industry programs as applicable to the reactor internals; and · Upon completion of these programs, but not less than 24 months before entering the period of extended operation, submit an inspection plan for reactor internals to the NRC for review and approval.	B2.1.32	U1 - 8/9/2011 U2 - 10/29/2012
26	The Reactor Head Closure Studs Program will be enhanced to incorporate controls that ensure that any future procurement of reactor head closure studs will be in accordance with the material and inspection guidance provided in NRC Regulatory Guide 1.65.	B2.1.33	U1 - 8/9/2013 U2 - 10/29/2014
27	The Reactor Vessel Surveillance Program will be enhanced as follows: · A requirement will be added to ensure that all withdrawn and tested surveillance capsules, not discarded as of August 31, 2000, are placed in storage for possible future reconstitution and use. · A requirement will be added to ensure that in the event spare capsules are withdrawn, the untested capsules are placed in storage and maintained for future insertion.	B2.1.34	U1 - 8/9/2013 U2 - 10/29/2014

APPENDIX A: PINGP LICENSE RENEWAL COMMITMENTS			
28	The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program will be enhanced as follows: · The program will include inspections of concrete and steel components that are below the water line at the Screenhouse and Intake Canal. The scope will also require inspections of the Approach Canal, Intake Canal, Emergency Cooling Water Intake, and Screenhouse immediately following extreme environmental conditions or natural phenomena including an earthquake, flood, tornado, severe thunderstorm, or high winds. · The program parameters to be inspected will include an inspection of water-control concrete components that are below the water line for cavitation and erosion degradation. · The program will visually inspect for damage such as cracking, settlement, movement, broken bolted and welded connections, buckling, and other degraded conditions following extreme environmental conditions or natural phenomena.	B2.1.35	U1 - 8/9/2013 U2 - 10/29/2014
29	A Selective Leaching of Materials Program will be completed. Program features will be as described in LRA B2.1.36.	B2.1.36	U1 - 8/9/2013 U2 - 10/29/2014

APPENDIX A: PINGP LICENSE RENEWAL COMMITMENTS			
30	The Structures Monitoring Program will be enhanced as follows: · The following structures, components, and component supports will be added to the scope of the inspections: - Approach Canal - Fuel Oil Transfer House - Old Administration Building and Administration Building Addition - Component supports for cable tray, conduit, cable, tubing tray, tubing, non-ASME vessels, exchangers, pumps, valves, piping, mirror insulation, non-ASME valves, cabinets, panels, racks, equipment enclosures, junction boxes, bus ducts, breakers, transformers, instruments, diesel equipment, housings for HVAC fans, louvers, and dampers, HVAC ducts, vibration isolation elements for diesel equipment, and miscellaneous electrical and mechanical equipment items - Miscellaneous electrical equipment and instrumentation enclosures including cable tray, conduit, wireway, tube tray, cabinets, panels, racks, equipment enclosures, junction boxes, breaker housings, transformer housings, lighting fixtures, and metal bus enclosure assemblies - Miscellaneous mechanical equipment enclosures including housings for HVAC fans, louvers, and dampers - SBO Yard Structures and components including SBO cable vault and bus duct enclosures. - Fire Protection System hydrant houses - Caulking, sealant and elastomer materials - Nonsafety-related masonry walls that support equipment relied upon to perform a function that demonstrates compliance with a regulated event(s). · The program will be enhanced to include additional inspection parameters. · The program will require an inspection frequency of once every five (5) years for structures and structural components within the scope of the program. The frequency of inspections can be adjusted, if necessary, to allow for early detection and timely correction of negative trends. · The program will require periodic sampling of groundwater and river water chemistries to ensure they remain non-aggressive.	B2.1.38	U1 - 8/9/2013 U2 - 10/29/2014
31	A Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program will be implemented. Program features will be as described in LRA Section B2.1.39.	B2.1.39	U1 - 8/9/2013 U2 - 10/29/2014

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32	The Water Chemistry Program will be enhanced as follows: · The program will require increased sampling to be performed as needed to confirm the effectiveness of corrective actions taken to address an abnormal chemistry condition. · The program will require Reactor Coolant System dissolved oxygen Action Level limits to be consistent with the limits established in the EPRI PWR Primary Water Chemistry Guidelines. [Revised in letter dated 12/5/2008 in response to RAI B2.1.40-3]	B2.1.40	U1 - 8/9/2013 U2 - 10/29/2014
33	The Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced as follows: · The program will monitor the six component locations identified in NUREG/CR-6260 for older vintage Westinghouse plants, either by tracking the cumulative number of imposed stress cycles using cycle counting, or by tracking the cumulative fatigue usage, including the effects of coolant environment. The following locations will be monitored: - Reactor Vessel Inlet and Outlet Nozzles - Reactor Pressure Vessel Shell to Lower Head - RCS Hot Leg Surge Line Nozzle - RCS Cold Leg Charging Nozzle - RCS Cold Leg Charging Nozzle - RCS Cold Leg Safety Injection Accumulator Nozzle - RHR-to-Accumulator Piping Tee · Program acceptance criteria will be clarified to require corrective action to be taken before a cumulative fatigue usage factor exceeds 1.0 or a design basis transient cycle limit is exceeded. [Revised in letter dated 1/9/2009 in response to RAI 4.3.1.1-1]	B3.2	U1 - 8/9/2013 U2 - 10/29/2014
34	Reactor internals baffle bolt fatigue transient limits of 1835 cycles of plant loading at 5% per minute and 1835 cycles of plant unloading at 5% per minute will be incorporated into the Metal Fatigue of Reactor Coolant Pressure Boundary Program and UFSAR Table 4.1-8.	B3.2	U1 - 8/9/2013 U2 - 10/29/2014
35	NSPM will perform an ASME Section III fatigue evaluation of the lower head of the pressurizer to account for effects of insurge/outsurge transients. The evaluation will determine the cumulative fatigue usage of limiting pressurizer component(s) through the period of extended operation. The analyses will account for periods of both “Water Solid” and “Standard Steam Bubble” operating strategies. Analysis results will be incorporated, as applicable, into the Metal Fatigue of Reactor Coolant Pressure Boundary Program. [Revised in letter dated 1/9/2009 in response to RAI 4.3.1.1-1]	4.3.1.3	U1 - 8/9/2013 U2 - 10/29/2014

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36	NSPM will complete fatigue calculations for the pressurizer surge line hot leg nozzle and the charging nozzle using the methodology of the ASME Code (Subsection NB) and will report the revised CUFs and CUFs adjusted for environmental effects at these locations as an amendment to the PINGP LRA. Conforming changes to LRA Section 4.3.3, "PINGP EAF Results," will also be included in that amendment to reflect analysis results and remove references to stress-based fatigue monitoring. [Added in letter dated 1/9/2009 in response to RAI 4.3.1.1-1]	4.3.3	4/30/2009 Letter dated 4/28/2009 from the applicant to NRC addresses this commitment, see ML091190418
37	NSPM will revise procedures for excavation and trenching controls and archaeological, cultural and historic resource protection to identify sensitive areas and provide guidance for ground-disturbing activities. The procedures will be revised to include drawings and illustrations to assist users in identifying culturally sensitive areas, and pictures of artifacts that are prevalent in the area of the Plant site. The revised procedures will also require training of the Site Environmental Coordinator and other personnel responsible for proper execution of excavation or other ground-disturbing activities. [Added in ER revision submitted in letter dated 3/4/2009]	ER 4.16.1	8/9/2013
38	NSPM will conduct a Phase I Reconnaissance Field Survey of the disturbed areas within the Plant's boundaries. In addition, NSPM will conduct Phase I field surveys of areas of known archaeological sites to precisely determine their boundaries. NSPM will use the results of these surveys to designate areas for archaeological protection. [Added in ER revision submitted in letter dated 3/4/2009]	ER 4.16.2	8/9/2013
39	NSPM will prepare, maintain and implement a Cultural Resources Management Plan (CRMP) to protect significant historical, archaeological, and cultural resources that may currently exist on the Plant site. In connection with the preparation of the CRMP, NSPM will conduct botanical surveys to identify culturally and medicinally important species on the Plant site, and incorporate provisions to protect such plants into the CRMP. [Added in ER revision submitted in letter dated 3/4/2009]	ER 4.16.2	8/9/2013
40	NSPM will consult with a qualified archaeologist prior to conducting any ground-disturbing activity in any area designated as undisturbed and in any disturbed area that is described as potentially containing archaeological resources (as determined by the Phase I Reconnaissance Field Survey discussed in Commitment Number 38). [Added in ER revision submitted in letter dated 3/4/2009]	ER 4.16.2	8/9/2013

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41	During the first refueling outage following refueling cavity leak repairs in each Unit (scheduled for refueling outages 1R26 and 2R26), concrete will be removed from the sump C pit to expose an area of the containment vessel bottom head. Visual examination and ultrasonic thickness measurement will be performed on the portions of the containment vessels exposed by the excavations. An assessment of the condition of exposed concrete and rebar will also be performed. Degradation observed in the exposed containment vessel, concrete or rebar will be entered into the Corrective Action Program and evaluated for impact on structural integrity and identification of additional actions that may be warranted. [Added in letter dated 4/6/09 in response to Follow Up RAI B2.1.38]	B2.1.38	U1 - 8/9/2013 U2 - 10/29/2014
42	During the two consecutive refueling outages following refueling cavity leak repairs in each Unit (scheduled for refueling outages 1R26 and 2R26), visual inspections will be performed of the areas where reactor cavity leakage had been observed previously to confirm that leakage has been resolved. The inspection results will be documented. If refueling cavity leakage is again identified, the issue will be entered into the Corrective Action Program and evaluated for identification of additional actions to mitigate leakage and monitor the condition of the containment vessel and internal structures. [Added in letter dated 4/6/09 in response to Follow Up RAI B2.1.38]	B2.1.38	U1 - 8/9/2013 U2 - 10/29/2014
43	Preventive maintenance requirements will be implemented to require periodic replacement of rubber flexible hoses in the Diesel Generators and Support System that are exposed to fuel oil or lubricating oil internal environments. [Added in letter dated 4/6/09 in response to RAI 3.3.2-8-1]	Table 3.3.2-8	U1 - 8/9/2013 U2 - 10/29/2014

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APPENDIX B

CHRONOLOGY

This appendix lists chronologically the licensing correspondence between the staff of the U.S. Nuclear Regulatory Commission (NRC) (the staff) and Northern States Power Company, a Minnesota Corporation, (NSPM or the applicant). This appendix also lists other correspondence concerning the staff's review of the Prairie Island Nuclear Generating Plant, Units 1 and 2, license renewal application (LRA) (Docket Nos. 50-282 and 50-306).

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Date	**Subject**
4/11/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island, Units 1 and 2 - Application for Renewed Operating Licenses to be Extended 20 Years Beyond Current Expiration Dates (ADAMS Accession No. ML081130666)
4/11/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island, Units 1 and 2 - Application for Renewed Operating Licenses, Technical and Administrative Information (ADAMS Accession No. ML081130673)
4/11/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island Nuclear Generating Plant, Units 1 and 2 - Supporting Information for NRC Review of Application for Renewed Operating Licenses (ADAMS Accession No. ML081140720)
4/16/2008	Letter from Northern States Power Co Nuclear Management Co LLC to NRC, Prairie Island, Units 1 & 2, and Monticello, Application for Order and Conforming License Amendments to Transfer Operating Authority Under Facility Operating Licenses (ADAMS Accession No. ML081090353)
4/28/2008	Letter from NRC to Nuclear Management Co LLC, Receipt and Availability of the LRA for the Prairie Island Nuclear Generating Plant, Units 1 and 2 (ADAMS Accession No. ML081050091)
4/28/2008	Federal Register Notice, Receipt and Availability of the LRA for the Prairie Island Nuclear Generating Plant, Units 1 and 2 (ADAMS Accession No. ML081050100)
4/30/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island, Units 1 and 2 - Applicant's Environmental Report - Operating License Renewal Stage, Appendix E, Table of Contents through Section 2.0, "Site and Environmental Interfaces" (ADAMS Accession No. ML081130677)
4/30/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island, Units 1 and 2 - Applicant's Environmental Report - Operating License Renewal Stage, Appendix E, Section 3.0, "Proposed Action," through Section 9.0, "Status of Compliance" (ADAMS Accession No. ML081130681)

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4/30/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island, Units 1 and 2 - Applicant's Environmental Report - Operating License Renewal Stage, Appendix E, Attachment A, "NRC NEPA Issues for License Renewal of Nuclear Power Plants," through Attachment F, "Severe Accident Mitigation Alternatives" (ADAMS Accession No. ML081130684)
5/6/2008	Federal Register Notice, Prairie Island, FRN - Notice of Receipt and Availability of Application for Renewal of Prairie Island Nuclear Generating Plant - 73 FR 25034 (ADAMS Accession No. ML083500086)
5/13/2008	Press Release-08-093: License Renewal Application for Prairie Island Nuclear Plant Available for Public Inspection (ADAMS Accession No. ML081340103)
5/16/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island, Units 1 and 2, Supplemental Information Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML081400797)
5/19/2008	Letter from NRC to Nuclear Management Co LLC, Receipt and Availability of the License Renewal Application for the Prairie Island Nuclear Generating Plant, Units 1 and 2 (ADAMS Accession No. ML081330711)
5/19/2008	Federal Register Notice, Notice of Receipt and Availability of Application for Renewal of Prairie Island Nuclear Generating Plant, Units 1 and 2.Notice of Receipt and Availability of Application for Renewal of Prairie Island Nuclear Generating Plant, Units 1 and 2 (ADAMS Accession No. ML081330712)
5/30/2008	Letter from Nuclear Management Co LLC to NRC, Prairie Island, Units 1 and 2 - Revised Boundary Drawings to Support NRC Review of Application for Renewed Operating Licenses (ADAMS Accession No. ML081560697)
6/10/2008	Federal Register Notice, Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding Renewal of Facility Operating License Nos. DPR-42 and DPR-60 for an Additional 20-year Period (ADAMS Accession No. ML081370294)
6/17/2008	Federal Register Notice, Prairie Island, FRN - Notice of Acceptance for Docketing of Application and Notice of Opportunity for Hearing Re Renewal of License - 73 FR 34335 (ADAMS Accession No. ML083500089)
6/26/2008	Federal Register, Notice of Intent To Prepare an Environmental Impact Statement and Conduct Scoping Process For License Renewal For The Prairie Island Nuclear Generating Plant Units 1 & 2 (TAC Nos. MD8528, MD8529) (ADAMS Accession No. ML081620382)
7/15/2008	Federal Register Notice, Prairie Island Nuclear Generating Plant, Units 1 and 2-Notice of Intent (TAC Nos. MD8528 and MD8529) (ML081970679)

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7/22/2008	Federal Register Notice, Prairie Island, FRN - Notice of Intent to Prepare and EIS and Conduct Scoping - 73 FR 42628 (ADAMS Accession No. ML083500090)
7/30/2008	Transcript of Prairie Island License Renewal Public Scoping Meeting on 07/30/2008 - Afternoon Session, Pp. 1-44 (ADAMS Accession No. ML082470336)
7/30/2008	Prairie Island License Renewal Public Scoping Meeting Transcript: Evening Session, July 30, 2008, Pages 1-79 (ADAMS Accession No. ML082490514)
9/8/2008	Prairie Island, License Renewal Environmental Report Additional Information, Documents Requested During NRC Environmental Review, Surface Water, Binder 2 of 3 (ADAMS Accession No. ML083120222)
9/8/2008	Prairie Island, License Renewal Environmental Report Additional Information, Documents Requested During NRC Environmental Review, Surface Water, Binder 1 of 3 (ADAMS Accession No. ML083120223)
9/8/2008	Prairie Island, License Renewal Environmental Report Additional Information, Documents Requested During NRC Environmental Review, Socioeconomics, Binder 1 of 1 (ADAMS Accession No. ML083120226)
9/8/2008	Prairie Island, License Renewal Environmental Report Additional Information, Documents Requested During NRC Environmental Review, Groundwater Resources, Binder 1 of 1 (ADAMS Accession No. ML083120227)
9/8/2008	Prairie Island, License Renewal Environmental Report Additional Information, Documents Requested During NRC Environmental Review, Terrestrial Ecology, Binder 1 of 1 (ADAMS Accession No. ML083120228)
9/18/2008	Prairie Island, License Renewal Environmental Report Additional Information, Documents Requested During NRC Environmental Review, Environmental Health & Waste Issues, Binder 1 of 1 (ADAMS Accession No. ML083120229)
9/26/2008	Letter from Northern States Power Co to NRC, Prairie Island Nuclear Generating Plant Units 1 and 2, Submittal of Documents for Public Disclosure as Requested During NRC License Renewal Environmental Audit (ADAMS Accession No. ML083120218)
10/23/2008	Letter from NRC to Nuclear Management Co LLC, Review of the Prairie Island Nuclear Generating Plant Units 1 & 2, License Renewal Application (Tac Nos. MD8513 and MD8514) (ADAMS Accession No. ML082950551)
11/4/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant Units 1 & 2, License Renewal Application (ADAMS Accession No. ML082970818)

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11/5/2008	Letter from NRC to Northern States Power Co Nuclear Management Co, LLC, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML082830947)
11/6/2008	Letter from NRC to Nuclear Management Co LLC, Prairie Island, Units 1 & 2, Information Request For NRC License Renewal Inspection (ADAMS Accession No. ML083110863)
11/12/2008	Letter Northern States Power Co to NRC, Prairie Island Nuclear Generating Units 1 and 2, Responses to NRC Requests for Additional Information Dated November 4, 2008 Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083370202)
11/19/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML083010585)
11/19/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML083180394)
11/19/2008	Letter from NRC to Northern States Power Co, Request for Additional Information License Renewal Application, Prairie Island Nuclear Generating Plant, Units 1 & 2 (ADAMS Accession No. ML083240032)
11/20/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML083180962)
11/20/2008	Letter from NRC to Northern States Power Co, Request for Additional Information, Prairie Island Units 1 & 2 License Renewal Application, Sections 4.7.1 and 2.5 (ADAMS Accession No. ML083181015)
11/21/2008	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2, Responses to NRC Requests for Additional Information Dated October 23, 2008, Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083370505)
11/25/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML083180558)

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12/1/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) RAI 2.4.1-1, 2.4.3-1, 2.4.7-1, 2.4.7-2, 2.4.8-1, 2.4.11-1 (ADAMS Accession No. ML083250716)
12/2/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML083310078)
12/5/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC MD8513 and MD8514). RAIB2.1.3-1; B2.1.27-1; B2.1.8-1; B2.1.8-2; B2.1.8-3; B2.1.8-4; B2.1.19-1; B2.1.19-2; B2.1.19-3 (ADAMS Accession No. ML083250720)
12/10/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML083010561)
12/11/2008	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2 - Responses to NRC Requests for Additional Information Dated November 19, 2008 Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083650032)
12/11/2008	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2, Responses to NRC Requests for Additional Information Dated November 20, 2008 Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083650035)
12/11/2008	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2, Responses to NRC Requests for Additional Information Dated November 25, 2008, Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083650036)
12/11/2008	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2, Responses to NRC Requests for Additional Information Dated December 1, 2008 Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083650037)
12/16/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for the Review of the Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC MD8513 and MD8514) (ADAMS Accession No. ML083250329)
12/18/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for The Review of The Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) (ADAMS Accession No. ML083170561)

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12/18/2008	Letter from NRC to Northern States Power Co, Request for Additional Information for The Review of The Prairie Island Nuclear Generating Plant, Units 1 & 2, License Renewal Application (TAC Nos. MD8513 and MD8514) Cover Letter (ADAMS Accession No. ML083170566)
12/18/2008	Letter from Northern States Power Co to NRC Prairie Island, Units 1 and 2, Responses to Requests for Additional Information Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083590337)
12/18/2008	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2, Responses to Requests for Additional Information Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML083590341)
12/24/2008	Letter from NRC to Northern States Power Co, Request for Additional Information Regarding the Review of the License Renewal Application for Prairie Island Nuclear Generating Plant, Units 1 and 2 (TAC MD8528 and MD8529) (ADAMS Accession No. ML083520121)
1/9/2009	Letter from Northern States Power Co to NRC Prairie Island, Units 1 and 2 - Responses to NRC Requests for Additional Information Dated December 10, 2008 Regarding Application for Renewed Operating License (ADAMS Accession No. ML090120541)
1/15/2009	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2 - Responses to NRC Requests for Additional Information Dated December 16, 2008 Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML090210645)
1/16/2009	Letter from Northern States Power Co to NRC, Prairie Island, Units 1 and 2, Responses to NRC Requests for Additional Information Dated December 2, 2008 Regarding Application for Renewed Operating Licenses (ADAMS Accession No. ML090360518)
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APPENDIX C

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APPENDIX D

REFERENCES

This appendix lists the references used throughout this SER for review of the LRA for Prairie Island Nuclear Generating Plant, Units 1 and 2.

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