NUREG-1825

Safety Evaluation Report
Related to the License Renewal of the Joseph M. Farley Nuclear Plant, Units 1 and 2

Docket Nos. 50-348 and 50-364

Southern Nuclear Operating Company, Inc.

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555-0001

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March 2005

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, license renewal application (LRA) by the staff of the U.S. Nuclear Regulatory Commission (NRC) (the staff). By letter dated September 12, 2003, Southern Nuclear Operating Company, Inc. (SNC or the applicant) submitted the LRA for FNP in accordance with Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR Part 54). The SNC is requesting renewal of the operating licenses for FNP, Units 1 and 2 (Facility Operating License Numbers NPF-2 and NPF-8, respectively) for a period of 20 years beyond the current expiration dates of midnight, June 25, 2017, for Unit 1 and midnight, March 31, 2021, for Unit 2.

The FNP units are located about 16.5 miles east of the City of Dothan, in Houston County, Alabama, on the west bank of the Chattahoochee River. The NRC issued the construction permits for FNP, Units 1 and 2, on August 16, 1972. The operating licenses were issued by the NRC on June 25, 1977, for Unit 1 and March 31, 1981, for Unit 2. The FNP consists of two Westinghouse pressurized-water reactor units. Each unit is designed to generate 2775 megawatt thermal (MWt), or approximately 910 megawatt electric (MWe).

The staff reviewed the FNP license renewal application in accordance with Commission regulations and NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated July 2001. The staff's conclusion of its review of the FNP LRA can be found in Section 6 of this SER.

Since its issuance, the SER has been revised to clarify a license condition listed in Section 1, Introduction and General Discussion, under Subsection 1.7, Summary of Proposed License Conditions. The revision is identified by a status bar in the right margin.

The NRC license renewal project manager is Ms. Tilda Liu. Ms. Liu may be reached at (301) 415-1315. Written correspondence should be addressed to the License Renewal and Environmental Impacts Program, Mail Stop O-11F1, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

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ABBREVIATIONS

ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
AFW	auxiliary feedwater
AISC	American Institute of Steel Construction
AMP	aging management program
AMR	aging management review
AMSAC	ATWS mitigating system actuation circuitry
APC	Alabama Power Company
ART	adjusted reference temperature
AS&CR	auxiliary steam and condensate recovery
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
BTRS	boron thermal regeneration system
BWR	boiling-water reactor
CASS	cast austenitic stainless steel
CCW	closed cooling water or component cooling water
CET	core exit thermocouple
CF	chemistry factor
CFR	*Code of Federal Regulations*
CLB	current licensing basis
CR	condition report
CRDM	control rod drive mechanism
CRGT	control rod guide tube
CS	containment spray
CST	condensate storage tank
CUF	cumulative usage factor
CVCS	chemical and volume control system
DBA	design-basis accident
DBE	design-basis event
DW	demineralized water
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPY	effective full-power year
EOL	end of life
EPRI	Electric Power Research Institute
EQ	environmental qualification
ESF	engineered safety feature
FAC	flow-accelerated corrosion
F_{en}	environmental fatigue factor
FNP	Farley Nuclear Plant
FP	fire protection
FPP	fire protection plan
FSAR	final safety analysis report
FSD	functional system description
FW	feedwater

GALL	generic aging lessons learned
GDC	general design criteria or general design criterion
GEIS	generic environmental impact statement
GSI	generic safety issue
HAZ	heat-affected zone
HELB	high-energy line break
HE/ME	high energy/moderate energy
HJTC	heated junction thermocouple
HVAC	heating, ventilation, and air conditioning
HX	heat exchanger
I&C	instrumentation and control
IEEE	Institute of Electrical and Electronics Engineers
IGA	intergranular attack
IN	information notice
IPA	integrated plant assessment
ISG	interim staff guidance
ISI	inservice inspection
LBB	leak before break
LOCA	loss-of-coolant accident
LOSP	loss of offsite power
LRA	license renewal application
MWe	megawatt electric
MWt	megawatt thermal
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NPAR	nuclear plant aging research
NRC	U.S. Nuclear Regulatory Commission
NSR	nonsafety related
NSSS	nuclear steam supply system
ODSCC	outside-diameter stress-corrosion cracking
OBE	operating-basis earthquake
P&ID	piping and instrumentation diagram
PRF	penetration room filtration
PSRF	nonsafety related that can prevent a safety-related function
PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PW	pipe whip
PWR	pressurized-water reactor
PWSCC	primary water stress-corrosion cracking
RAI	request for additional information
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	regulatory guide
RHR	residual heat removal
RI-ISI	risk-informed inservice inspection
RMWST	reactor makeup water storage tank
RPV	reactor pressure vessel

RT_{NDT}	reference temperature nil ductility transition
RT_{PTS}	reference temperature pressurized thermal shock
RTS	reactor trip system
RVLIS	reactor vessel level instrumentation system
RWST	refueling water storage tank
SBO	station blackout
SC	structure and component
SCC	stress-corrosion cracking
SER	safety evaluation report
SFP	spent fuel pool
SGBD	steam generator blowdown
SI	safety injection
SMP	structural monitoring program
SNC	Southern Nuclear Operating Company, Inc.
SR	safety related
SRP	Standard Review Plan
SRP-LR	standard review plan—license renewal
SSC	system, structure, and component
SSE	safe-shutdown earthquake
SW	service water
SWIS	service water intake structure
TLAA	time-limited aging analysis
TPNS	total plant numbering system
TS	technical specification
TSP	trisodium phosphate
UFSAR	updated final safety analysis report
USE	upper-shelf energy
WCAP	Westinghouse Commercial Atomic Power (report)
WOG	Westinghouse Owners Group

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1. INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) on the application for license renewal for the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, as filed by the Southern Nuclear Operating Company, Inc. (SNC or the applicant). By letter dated September 12, 2003, SNC submitted its application to the U.S. Nuclear Regulatory Commission (NRC or the Commission) for renewal of the FNP operating licenses for an additional 20 years. The NRC staff (the staff) prepared this report, which summarizes the results of its safety review of the renewal application for compliance with the requirements of Title 10, Part 54, of the *Code of Federal Regulations*, (10 CFR Part 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." The NRC license renewal project manager for the FNP license renewal review is Ms. Tilda Liu. Ms. Liu can be contacted by telephone at 301-415-1315 or electronic mail at tyl1@nrc.gov. Alternatively, written correspondence may be sent to the following address:

License Renewal and Environmental Impacts Program
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Attention: Tilda Liu, Mail Stop O-11F1

In its September 12, 2003, submittal letter, the applicant requested renewal of the operating licenses issued under Section 103 of the Atomic Energy Act of 1954, as amended, for FNP, Units 1 and 2 (Facility Operating License Numbers NPF-2 and NPF-8, respectively), for a period of 20 years beyond the current license expiration dates of midnight, June 25, 2017, for Unit 1 and midnight, March 31, 2021, for Unit 2. The FNP units are located about 16.5 miles east of the City of Dothan, in Houston County, Alabama, on the west bank of the Chattahoochee River. The NRC issued the construction permits for FNP, Units 1 and 2, on August 16, 1972. The NRC issued the operating licenses on June 25, 1977, for Unit 1 and March 31, 1981, for Unit 2. The FNP consists of two Westinghouse pressurized-water reactor units. Each unit is designed to generate 2775 megawatt thermal (MWt), or approximately 910 megawatt electric (MWe). The final safety analysis report (FSAR) contains details concerning 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 found in 10 CFR Parts 54 and 51, respectively, state the requirements for these reviews. The safety review for the FNP license renewal is based on the applicant's license renewal application (LRA) and on the responses to the staff's requests for additional information (RAIs). The applicant provided supplemental information to its LRA as well as responses to the staff's RAIs and other docketed correspondence. Unless otherwise noted, the staff reviewed and considered information submitted through September 15, 2004. The staff reviewed information received after that date on a case-by-case basis, depending on the stage of the safety review and the volume and complexity of the information. The public may review the LRA and all pertinent information and materials, including the FSAR mentioned above, at the NRC Public Document Room, located in One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, 20852-2738 (301-415-4737/800-397-4209), and at the Houston Love Memorial Library, 212 West Burdeshaw Street, Dothan, Alabama 36303-4421. In addition, the public may find the FNP, Units 1 and 2, LRA, as well as materials related to the license renewal review, on the NRC Web site at www.nrc.gov.

This SER summarizes the results of the staff's safety review of the FNP LRA and describes the technical details considered in evaluating the safety aspects of its proposed operation for an additional 20 years beyond the term of the current operating license. The staff reviewed the LRA in accordance with the NRC regulations and the guidance provided in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated July 2001.

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

Appendix A to this SER is a table that identifies the applicant's commitments associated with the renewal of the operating licenses. Appendix B provides a chronology of the principal correspondence between the NRC and the applicant related to the review of the application. Appendix C presents an index of the staff's RAIs and the applicant's responses. Appendix D is a list of principal contributors to this SER. Appendix E is a bibliography of the references used during the course of the review.

In accordance with 10 CFR Part 51, the staff prepared a draft plant-specific supplement to the Generic Environmental Impact Statement (GEIS). This supplement discusses the environmental considerations related to renewing the licenses for FNP, Units 1 and 2. The NRC staff issued NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 18: Regarding Joseph M. Farley Plant, Units 1 and 2, Draft Report for Comment," on August 6, 2004.

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. These licenses can be renewed for up to 20 additional years. The original 40-year license term was selected on the basis of economic and antitrust considerations, rather than on technical limitations. However, some individual plant and equipment designs may have been engineered on the basis of an expected 40-year service life.

In 1982, the NRC 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. On the basis of the results of that research, a technical review group concluded that many aging phenomena are readily manageable and do not pose technical issues that would preclude life extension for nuclear power plants. In 1986, the NRC 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 NRC published the license renewal rule in 10 CFR Part 54 (the Rule). The NRC participated in an industry-sponsored demonstration program to apply the rule to a pilot plant and to gain experience necessary to develop implementation guidance. To establish a scope of review for license renewal, the Rule defined age-related degradation unique to license renewal.

However, during the demonstration program, the NRC found that many aging mechanisms occur and are managed during the period of initial license. In addition, the NRC found that the scope of the review did not allow sufficient credit for existing programs, particularly the implementation of the Maintenance Rule, which also manages certain plant aging phenomena. As a result, the NRC amended the license renewal rule in 1995. The amended 10 CFR Part 54 established a regulatory process that is simpler, more stable, and more predictable than the previous license renewal rule. In particular, the NRC amended 10 CFR Part 54 to focus on managing the adverse effects of aging rather than on identifying age-related degradation unique to license renewal. The NRC initiated 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 revised rule clarified and simplified the integrated plant assessment (IPA) process to be consistent with the revised focus on passive, long-lived structures and components (SCs).

In parallel with these efforts, the NRC pursued a separate rulemaking effort and developed 10 CFR Part 51 to focus the scope of the review of environmental impacts of license renewal and to fulfill, in part, the NRC's responsibilities under the National Environmental Policy Act of 1969 (NEPA).

1.2.1 Safety Review

License renewal requirements for power reactors are based on two principals:

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants provide and maintain an acceptable level of safety, with the possible exception of the detrimental effects of aging on the functionality of certain SSCs during the period of extended operation, as well as a few other issues related to safety 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 defines the scope of license renewal as those SSCs (1) that are safety related, (2) whose failure could affect safety-related functions, and (3) that are relied on to demonstrate compliance with the NRC's regulations for fire protection (FP), environmental qualification (EQ), pressurized thermal shock (PTS), anticipated transients without scram (ATWS), and station blackout (SBO).

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

Pursuant to 10 CFR 54.21(d), each LRA is required to include a supplement to the Final Safety Analysis Report (FSAR). This FSAR Supplement must contain a summary description of the applicant's programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses for the period of extended operation.

License renewal also requires the identification and updating of time-limited aging analyses (TLAAs). During the design phase for a plant, certain assumptions are made about the length of time the plant will operate. These assumptions are incorporated into design calculations for a number of the plant's 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 effects of aging on these SSCs will be adequately managed for the period of extended operation.

In 2001, the NRC developed and issued Regulatory Guide (RG) 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses." This RG endorses NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule," which was issued in March 2001 by the Nuclear Energy Institute (NEI). NEI 95-10 details an acceptable method of implementing the license renewal rule. The NRC also used the SRP-LR to review this application.

SNC utilizes the process defined in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," issued in July 2001. The GALL Report provides the staff with a summary of staff-approved aging management programs (AMPs) for the aging of many SCs that are subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources used to review an applicant's LRA will be greatly reduced, thereby 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 also serves as a reference for both applicants and staff reviewers to quickly identify those AMPs and activities that the staff has determined will provide adequate aging management during the period of extended operation.

1.2.2 Environmental Review

Title 10, Part 51, of the *Code of Federal Regulations* governs the environmental protection regulations. In December 1996, the staff revised the environmental protection regulations to facilitate the environmental review for license renewal. The staff prepared a "Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants" (NUREG-1437, Revision 1) to document its evaluation of the possible environmental impacts associated with renewing licenses of nuclear power plants. For certain types of environmental impacts, the GEIS establishes generic findings that are applicable to all nuclear power plants. Appendix B to Subpart A of 10 CFR Part 51 identifies these generic findings. Pursuant to 10 CFR 51.53(c)(3)(i), an applicant for license renewal may incorporate these generic findings in its environmental report. In accordance with 10 CFR 51.53(c)(3)(ii), an environmental report must include analyses of those environmental impacts that must be evaluated on a plant-specific basis (i.e., Category 2 issues).

In accordance with NEPA and the requirements of 10 CFR Part 51, the NRC performed a plant-specific review of the environmental impacts of license renewal, including whether new and significant information existed that the GEIS did not consider. As part of its scoping process, the NRC held a public meeting on January 8, 2004, in Dothan, Alabama, to identify environmental issues specific to the plant. The NRC's draft plant-specific Supplement 18 to the FNP, Units 1 and 2, GEIS, which was issued on August 6, 2004, documents the results of the environmental review and includes a preliminary recommendation with respect to the license renewal action. The NRC held another public meeting on September 30, 2004, in Dothan, Alabama, to discuss the draft plant-specific Supplement 18 to the FNP, Units 1 and 2, GEIS. After considering comments on the draft, the NRC prepared and published a final plant-specific supplement to the GEIS separately from this report. Supplement 18 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Joseph M. Farley Nuclear Plant, Units 1 and 2, Final Report," was published on March 9, 2005.

1.3 Principal Review Matters

Title 10, Part 54, of the *Code of Federal Regulations* describes the requirements for renewing operating licenses for nuclear power plants. The staff performed its technical review of the FNP LRA in accordance with Commission guidance and the requirements of 10 CFR Part 54. Title 10, Section 54.29 of the *Code of Federal Regulations* includes the standards for renewing a license. This SER describes the results of the staff's safety review.

In 10 CFR 54.19(a), the Commission requires a license renewal applicant to submit general information. The applicant provided this general information in Section 1 of its LRA for FNP, Units 1 and 2, which was submitted to the NRC by letter dated September 12, 2003. The staff finds that the applicant has submitted the information required by 10 CFR 54.19(a) in Section 1 of the LRA.

In 10 CFR 54.19(b), the Commission requires that LRAs include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." The applicant stated the following in its LRA regarding this issue:

> The original Indemnity Agreement for FNP, which was effective as of July 20, 1976, provides that such agreement "shall terminate at the time of the expiration of that license specified in Item 3 of the Attachment, which is the last to expire." The license originally listed in Item 3 of the Attachment was SNM-1647. Since July 20, 1976, however, the Indemnity Agreement has been amended in order to add license numbers NFP-2, SNM-1868, and NPF-8 to Item 3 of the Attachment. As a consequence of these amendments, the existing Indemnity Agreement is presently due to terminate at midnight, March 21, 2021, as the last of these licenses expires. SNC requests that conforming changes be made to Item 3 of the Attachment to the Indemnity Agreement (and any other applicable provisions of the Indemnity Agreement and/or the attachment) in order to make clear that the Indemnity Agreement is extended until the last expiration date of the renewed FNP operating licenses issued by the Commission in response to this application.

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

In 10 CFR 54.21, the Commission requires that each LRA for a renewed license of a nuclear facility must contain (a) an IPA, (b) a description of any CLB changes that occurred during staff review of the LRA, (c) an evaluation of TLAAs, and (d) a FSAR Supplement. Sections 3 and 4 and Appendix B to the LRA address the license renewal requirements of 10 CFR 54.21(a), (b), and (c). Appendix A to the LRA contains the license renewal requirements of 10 CFR 54.21(d).

In 10 CFR 54.21(b), the Commission requires that each year following submission of the LRA, and at least 3 months before the scheduled completion of the staff's review, the applicant must submit an amendment to the renewal application that identifies any changes to the CLB of the facility that materially affect the contents of the LRA, including the FSAR Supplement. The applicant submitted an update to the LRA by letter dated July 20, 2004, which summarized the changes to the CLB that have occurred at FNP, Units 1 and 2, during the staff's review of the LRA. This submission satisfies the requirements of 10 CFR 54.21 (b).

In accordance with 10 CFR 54.22, an applicant's LRA must include changes or additions to the technical specifications (TS) that are necessary to manage the effects of aging during the period of extended operation. In Appendix D to the LRA, the applicant stated that it had not identified any TS changes as being necessary to support issuance of the renewed operating licenses for FNP, Units 1 and 2. This adequately addresses the requirement specified in 10 CFR 54.22.

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

The final plant-specific supplement to the GEIS will document the staff's evaluation of the environmental information required by 10 CFR 54.23 and will specify the considerations related to renewing the licenses for FNP, Units 1 and 2. The staff will prepare this supplement separately from this SER. As required by 10 CFR 54.25, the ACRS will issue a report to document its evaluation of the staff's LRA review and associated SER. Section 5 of this SER will incorporate the ACRS report, once it is issued. Section 6 will document the findings required by 10 CFR 54.29.

1.4 Interim Staff Guidance

The license renewal program is a living program. The NRC staff, industry, and other interested stakeholders gain experience and develop lessons learned with each renewed license. The lessons learned address the NRC's five (5) performance goals in safety, security, openness, effectiveness, and management. An interim staff guidance (ISG) is documented for use by the NRC staff, industry, and interested stakeholders until it is incorporated into the license renewal guidance documents such as the SRP-LR and GALL report.

The following table provides the current set of ISGs that have been issued by the staff, as well as the SER sections in which the issues are addressed by the staff.

ISG Issue (Approved ISG No.)	**Purpose**	**SER Section**
GALL report presents one acceptable way to manage aging effects **(ISG-1)**	This ISG clarified that GALL report contains one acceptable way, and not the only way to manage aging for license renewal.	N/A
Station Blackout Scoping (SBO) **(ISG-2)**	The license renewal rule 10 CFR 54.4(a)(3) includes 10 CFR 50.63(a)(1)—SBO. The SBO rule requires that a plant must withstand and recover from an SBO event. The recovery time for offsite power is much faster than that of EDGs. The offsite power system should be included within the scope of license renewal.	2.5.2
Concrete Aging Management Program **(ISG-3)**	Lessons learned from the GALL demonstration project indicated that GALL is not clear whether concrete requires an AMP.	3.5.2.1 3.5.2.2.1 3.5.2.2.9
Fire Protection (FP) System Piping **(ISG-4)**	This ISG clarifies the staff position for wall thinning of FP piping system in GALL AMPs XI.M26 and XI.M27. The staff's new position is that there is no need to disassemble FP piping, as oxygen can be introduced in the FP piping which can accelerate corrosion. Instead, use a nonintrusive method, such as volumetric inspection. Testing of sprinkler heads should be performed every 50 years and 10 years after initial service. This ISG eliminates the Halon/carbon dioxide system inspections for charging pressure, valve line ups, and automatic mode of operation test from GALL; the staff considers these test verifications to be operational activities.	3.0.3.2.6

ISG Issue (Approved ISG No.)	Purpose	SER Section
Identification and Treatment of Electrical Fuse Holders **(ISG-5)**	The ISG includes fuse holders AMR and AMP (i.e., same as terminal blocks and other electrical connections). The position includes only fuse holders that are not inside the enclosure of active components (e.g., inside of switchgears and inverters). Operating experience finds that metallic clamps (spring-loaded clips) have a history of age-related failures from aging stressors such as vibration, thermal cycling, mechanical stress, corrosion, and chemical contamination. The staff finds that visual inspection of fuse clips is not sufficient to detect the aging effects from fatigue, mechanical stress, and vibration.	2.1.3.2.3 3.0.3.2.8 3.6.2.3.2
The ISG Process **(ISG-8)**	This ISG provides clarification and update to the ISG process on Improved License Renewal Guidance Documents.	N/A
Standardized Format for License Renewal Applications **(ISG-10)**	The purpose of this ISG is to provide a standardized license renewal application format for the 2003 applicants.	N/A

1.5 Summary of Open Items

Open items are items for which the applicant has not presented a sufficient basis for resolution. There was no such items identified in the Draft SER dated October 15, 2004.

1.6 Summary of Confirmatory Items

Confirmatory items are items for which the staff and the applicant have reached a satisfactory resolution, but the resolution has not yet been formally submitted to the staff. There was no such items identified in the Draft SER dated October 15, 2004.

1.7 Summary of Proposed License Conditions

As a result of the staff's review of the LRA for FNP, Units 1 and 2, including subsequent information and clarifications provided by the applicant, the staff identified three proposed license conditions.

The first license condition requires the applicant to include the FSAR Supplement required by

10 CFR 54.21(d) in the next FSAR update, as required by 10 CFR 50.71(e), following the issuance of the renewed licenses.

The second license condition requires that the future activities identified in the FSAR Supplement and Appendix A of this SER to be completed prior to the period of extended operation or as noted in Appendix A of this SER.

The third license condition is as follows:

> All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of 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 NRC prior to implementation. All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the NRC, as required by 10 CFR Part 50, Appendix H.

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2. STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 Scoping and Screening Methodology

2.1.1 Introduction

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

In Section 2.1, “Scoping and Screening Methodology,” of the license renewal application (LRA), the applicant described the scoping and screening methodology used to identify SSCs at the Farley Nuclear Plant (FNP) within the scope of license renewal and the SCs that are subject to an AMR. The staff reviewed the applicant’s scoping and screening methodology to determine if it meets the scoping requirements stated in 10 CFR 54.4(a) and the screening requirements stated in 10 CFR 54.21.

In developing the scoping and screening methodology for the FNP LRA, the applicant considered the requirements of 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” (the Rule), the Statement of Considerations (SOC) for the Rule, and the guidance presented by the Nuclear Energy Institute (NEI), “Industry Guideline for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule,” Revision 3, March 2001 (NEI 95-10). In addition, in developing this methodology, the applicant considered the correspondence between the U.S. Nuclear Regulatory Commission (NRC) and other applicants and/or the NEI.

2.1.2 Summary of Technical Information in the Application

In Sections 2.0 and 3.0 of the LRA, the applicant provided the technical information required by 10 CFR 54.21(a). In Section 2.1, “Scoping and Screening Methodology,” of the LRA, the applicant described the process used to identify the SSCs that meet the license renewal scoping criteria under 10 CFR 54.4(a), as well as the process used to identify the SCs that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

Additionally, Section 2.2 (“Plant Level Scoping Results”), Section 2.3 (“System Scoping and Screening Results: Mechanical Systems”), Section 2.4 (“Scoping and Screening Results: Structures”), and Section 2.5 (“Scoping and Screening Results: Electrical”) of the LRA amplify the process that the applicant uses to identify the SCs that are subject to an AMR. Section 3 of the LRA, “Aging Management Review Results,” contains the following information:

- Section 3.1, “Aging Management of Reactor Vessel, Internals, and Reactor Coolant System”

- Section 3.2, “Aging Management of Engineered Safety Features Systems”
- Section 3.3, “Aging Management of Auxiliary Systems”
- Section 3.4, “Aging Management of Steam and Power Conversion Systems”
- Section 3.5, “Aging Management of Containment, Structures and Component Supports”
- Section 3.6, “Aging Management of Electrical Components”

Section 4 of the LRA, “Time-Limited Aging Analyses,” contains the applicant’s identification and evaluation of time-limited aging analyses (TLAAs).

2.1.2.1 Scoping Methodology

In Section 2.1 of the LRA, the applicant described the methodology used to scope mechanical, structural, and electrical and instrumentation and controls (I&C) SSCs pursuant to the requirements of the 10 CFR 54.4(a) scoping criteria. The following sections present the applicant’s scoping methodology, as described in the LRA.

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

The applicant described the general approach to scoping safety-related (SR) and nonsafety-related (NSR) SSCs and SSCs credited with demonstrating compliance with certain regulated events in LRA Section 2.1.2, “Application of Scoping Criteria in 10 CFR 54.4(a).” The following sections describe the scoping approaches specific to each of the three 10 CFR 54.4(a) scoping criteria.

<u>Application of the Scoping Criteria in 10 CFR 54.4(a)(1)</u>

In LRA Sections 2.1.3.1, “SR Criteria Pursuant to 10 CFR 54.4(a)(1),” and 2.1.4, “Identification of Structures and Components Subject to Aging Management Review,” the applicant discussed the scoping methodology as it pertains to safety-related criteria in accordance with 54.4(a)(1). With respect to the safety-related criteria, the applicant stated that the SSCs within the scope of license renewal include safety-related SSCs that are relied upon during and following design-basis events (DBEs). The DBEs considered are consistent with the FNP, Units 1 and 2, current licensing basis (CLB). The final safety analysis report (FSAR), with emphasis on Chapters 6 and 15, provides the DBE analyses for FNP Units 1 and 2. Chapter 2 of the FSAR describes natural phenomena and external events. Chapter 3 of the FSAR describes structures designed to withstand DBEs, natural phenomena, and external events. The applicant identified the plant functions that meet the criteria of 10 CFR 54.4(a)(1) and are within the scope of license renewal. The applicant listed these functions in the scoping database, along with the systems and structures required to perform these safety-related functions. Tables 2.2-1a through 2.2-1f of the LRA list the systems and structures, and plant-level scoping results.

<u>Application of the Scoping Criteria in 10 CFR 54.4(a)(2)</u>

In LRA Sections 2.1.3.2, “NSR Criteria Pursuant to 10 CFR 54.4(a)(2),” 2.1.4, “Identification of Structures and Components Subject to Aging Management Review,” and 2.1.5.9, "10 CFR 54.4(a)(2) Scoping (ISG-09)," the applicant discussed the scoping methodology as it related to the NSR criteria in accordance with 10 CFR 54.4(a)(2). With respect to the NSR criteria, the applicant stated, in part, that it had performed a review to identify the NSR SSCs whose failure could prevent satisfactory accomplishment of the SR intended functions identified in 10 CFR 54.4(a)(1). The NSR SSCs that are within the scope of license renewal for FNP, Units 1 and 2, fall into two categories—(1) NSR SSCs that functionally support the operation of SR SSCs, and (2) NSR SSCs whose failure could cause an interaction with safety-related SSCs that could potentially result in the failure of the SR SSCs to perform their intended safety functions. Scoping of SSCs for the criteria of 10 CFR 54.4(a)(2) for FNP considered those failures identified in the CLB and plant-specific operating experience and any industrywide operating experience that is specifically applicable to FNP.

The applicant used a systematic process to identify mechanical components subject to the 10 CFR 54.4(a)(2) criteria. Specifically, the applicant established five categories of components based on a review of FNP's CLB documents, plant and industry operating experience, and NRC's guidance on scoping, including draft interim staff guidance (ISG)-09, "10 CFR 54.4(a)(2) Scoping." For each category of equipment, the applicant employed a combination of methods, including plant system walkdowns, plant piping and instrument drawing reviews, and evaluation of system technical documentation. The five categories of mechanical components that meet the requirements of 10 CFR 54.4(a)(2) include the following:

(1) high-energy NSR piping and mechanical components
(2) NSR piping and components attached to SR piping
(3) nonattached NSR piping
(4) relief paths for SR relief valves and SR pump recirculation lines
(5) NSR features to maintain penetration room filtration negative pressure envelope

The applicant placed the NSR civil SSCs that are in proximity to SR civil/mechanical/electrical SSCs, and whose failure could inhibit or adversely affect the performance of SR SSCs or SR functions, within the scope for aging effects evaluation. The applicant used a spaces approach to scope civil features inside structures housing SR SSCs that could cause an interaction with safety-related SSCs potentially resulting in the failure of the SR SSCs to perform their intended safety functions.

With respect to electrical systems, the Southern Nuclear Operating Company (SNC) design incorporates the isolation of SR components from NSR components, such that SSCs that could prevent or adversely affect a function that meets the criterion of 10 CFR 54.4(a)(1) are classified as SR. Therefore, the applicant placed these components in scope under 10 CFR 54.4(a)(1) rather than under 10 CFR 54.4(a)(2).

<u>Application of the Scoping Criteria in 10 CFR 54.4(a)(3)</u>

In LRA Sections 2.1.3.3, "Other Scoping Pursuant to 10 CFR 54.4 (a)(3)," 2.1.5.2, "SBO Scoping (ISG-02)," 2.1.5.4, "Fire Protection System Piping (ISG-04)," and 2.1.5.7, "Scoping Guidance for Fire Protection Systems Structures, and Components (ISG-07)," the applicant discussed the scoping methodology as it relates to the regulated event criteria, in accordance with 10 CFR 54.4(a)(3). With respect to the scoping criteria related to 10 CFR 54.4(a)(3), the applicant evaluated all regulated events including (1) fire protection (FP), (2) environmental qualification (EQ), (3) pressurized thermal shock (PTS), (4) anticipated transient without scram

(ATWS), and (5) station blackout (SBO). For each regulated event, the applicant identified and reviewed the applicable FNP plant-specific licensing basis documents, such as the FSAR, safety evaluation reports (SERs), licensing correspondence, plant-controlled databases, calculations, and analyses to establish the scoping determinations. Initially, the applicant included within the scope of license renewal the SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the applicable regulations.

In summary, the applicant included in the scope of license renewal the SSCs relied on in safety analyses or plant evaluations to perform an intended function that demonstrates compliance with NRC regulations for FP, EQ, PTS, ATWS, and SBO, in accordance with the criteria of 10 CFR 54.4(a)(3).

2.1.2.1.2 Documentation Sources Used for Scoping and Screening

In LRA Section 2.1.2, "Information Sources," the applicant stated that it had reviewed information from the following sources during the license renewal scoping and screening process:

- final safety analysis report
- current licensing basis information including technical specifications and docketed licensing correspondence
- functional system descriptions
- technical position papers prepared to support scoping evaluations of the regulated events identified in 10 CFR 54.4(a)(3)
- Maintenance Rule summary reports and scoping information
- plant drawings
- probabilistic risk assessment model

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

2.1.2.1.3 Plant- and System-Level Scoping

In LRA Section 2.1.3, "Scoping Procedure," the applicant described the scoping methodology for safety-related and nonsafety-related systems and structures and for equipment relied upon to perform a function for any of the five regulated events described in 10 CFR 54.4(a)(3).

The FNP scoping process began with development of a comprehensive list of plant functions focused on identifying SSCs as defined by 10 CFR 54(a). Functions are defined as required actions of a system or structure. The applicant compiled this preliminary list by reviewing the

FSAR, licensing correspondence, design-basis documents (DBDs), and design drawings, as applicable. It then combined or separated the preliminary functions as necessary, which resulted in a final set of plant functions to consider for scoping. The applicant evaluated each final plant function against the 10 CFR 54.4(a) criteria to determine if it met the definition of an intended function for license renewal. An expert panel convened to review the list of identified intended functions and the criteria that brought each into the scope of license renewal. The applicant then identified the systems and structures that perform each intended function.

2.1.2.1.4 Component-Level Scoping

After the applicant identified the intended functions of systems or structures within the scope of license renewal, it performed a review to determine which components of each in-scope system and structure supported license renewal intended functions. The applicant considered the components that supported intended functions to be within the scope of license renewal and screened them to determine if an AMR was required.

The applicant considered three component classifications (mechanical, civil and structural, and electrical) during this stage of the scoping methodology. The following discusses the scoping methodology for each of these component classifications.

Mechanical Component Scoping

The applicant described the scoping methodology for components within safety-related and nonsafety-related mechanical systems in Section 2.1.4 of the LRA. For each mechanical system determined to be within the scope of license renewal, the applicant developed a system evaluation boundary to identify the set of structures and components necessary to perform the intended functions for the given mechanical system. These evaluation boundaries included sets of piping and instrumentation diagrams (P&IDs) for each system. From the boundary diagrams, the applicant identified components that were required to ensure the system could perform its intended functions. Then, the applicant grouped them into relevant component types associated with each in-scope function and listed them in the scoping and screening database for further analysis.

Structural Component Scoping

Section 2.1.4 of the LRA discusses the scoping methodology associated with the structures and structural components. After it had identified SR structures and NSR structures that could impact SR SSCs, the applicant developed evaluation boundaries for the various plant structures within the scope of license renewal. Generally, the applicant applied the philosophy that a boundary for a building or structure is the entire building including base slabs, foundations, walls, beams, slabs, and steel superstructure. The applicant then identified the various types of structural elements, materials, and environments that make up the buildings and structures and listed them in the license renewal database. The applicant started with the list of structures and structural elements in NUREG-1801 and NEI 95-10 and supplemented that list with components unique to FNP by reviewing plant-specific structural drawings. In this way, the applicant was able to compile a comprehensive list of all plant structures and structural elements within the scope of license renewal.

Electrical and I&C Component Scoping

The applicant described the scoping process associated with electrical and I&C systems and components in Section 2.1.4 of the LRA. For these systems, the applicant elected to use a bounding or spaces approach as described in NEI 95-10. As a result, the electrical/I&C component types used throughout the plant were identified without regard to specific electrical/I&C system intended functions. Instead, the applicant identified all electrical and I&C component types in use at FNP and listed them in the license renewal database using the guidance in Appendix B to NEI 95-10. The applicant supplemented this list with any unique plant electrical components by reviewing plant component information, drawings, and technical information. The applicant organized the electrical component types into commodity groups such as breakers, switches, and cables. The applicant identified these electrical and I&C component commodity groups from a review of plant documents, controlled drawings, the plant equipment database, and interface with the parallel mechanical and civil/structural screening evaluations.

2.1.2.2 Screening Methodology

After determining the SSCs within the scope of license renewal, the applicant implemented a process for determining which SSCs would be subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). In LRA Section 2.1.4, "Identification of Structures and Components Subject to Aging Management Review," the applicant discussed the screening activities as they related to the SSCs that are within the scope of license renewal. The applicant divided the screening portion of the integrated license renewal plant assessment into three engineering disciplines—mechanical, civil/structural, and electrical and I&C.

2.1.2.2.1 Mechanical Component Screening

After the component-level scoping for mechanical systems, the applicant screened the mechanical components to identify those subject to an AMR. The applicant stated in LRA Section 2.1.4.1, "Mechanical Systems," that it screened each system identified to be within the scope of license renewal. This process evaluated the individual structures and components included within in-scope mechanical systems to identify specific structures and components that required an AMR. The applicant evaluated electrical interface components associated with in-scope mechanical systems under the electrical component scoping methodology. The applicant evaluated each mechanical component identified in the scoping phase and entered in the LR database against the screening criteria in 10 CFR 54.21(a)(1). All components that contribute to the performance of an intended function, perform their function without moving parts and without a change in configuration or properties, and are not subject to replacement based on a qualified life or specified time period (i.e., those that are passive and long-lived) are subject to an AMR.

2.1.2.2.2 Structural Component Screening

After determining which SSCs were within the scope of license renewal, the applicant implemented a process for determining which SCs would be subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). In LRA Section 2.1.4, "Identification of Structures and Components Subject to Aging Management Review," the applicant discussed the screening activities related to civil and structural SCs within the scope of license renewal. These screening activities consisted of the identification of passive components, long-lived components, component intended functions, consumables, and component replacement based on performance or condition. The applicant relied on the guidance in NEI 95-10 and Chapter 2 of the Standard Review Plan (SRP) to develop the plant-specific listing of passive components of interest during the review.

2.1.2.2.3 Electrical/I&C Component Screening

After the component-level scoping for electrical I&C systems, the applicant screened the electrical/I&C components to identify those subject to an AMR. In Section 2.1.4 of the LRA, the applicant described the methodology used to screen electrical/I&C components. Specifically, the applicant applied the criteria of 10 CFR 54.21(a)(1)(i) and (ii) to identify component commodity groups that perform their intended functions without moving parts or without a change in configuration or properties (referred to as passive components) and excluded those components or commodity groups that are subject to replacement based on a qualified life or specific time period (referred to as short-lived components). The applicant utilized the guidance of NEI 95-10 and EPRI TR10003057, "License Renewal Electrical Handbook," to identify these components. Electrical components included in the plant Environmental Qualification Program are replaced on a specified interval based on a qualified life. Therefore, components in the Environmental Qualification Program do not meet the long-lived criteria of 10 CFR 54.21(a)(1)(ii) and are short-lived per the regulatory definition, and thus are not subject to an AMR. Using these screening criteria, the applicant determined that for FNP, the electrical component types that require an AMR are cables, connectors, buswork, oil-static cables, and various switchyard components.

2.1.3 Staff Evaluation

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

- 10 CFR 54.4(a), as it relates to the identification of plant SSCs within the scope of the Rule

- 10 CFR 54.4(b), as it relates to the identification of the intended functions of plant SSCs determined to be within the scope of the Rule

- 10 CFR 54.21(a)(1) and (a)(2), as they relate to the methods utilized by the applicant to identify plant structures and components subject to an AMR

As part of the review of the applicant's scoping and screening methodology, the NRC staff reviewed the activities described in the following sections of the LRA using the guidance contained in NUREG-1800:

- Section 2.1, "Scoping and Screening Methodology," to ensure that the applicant describes a process for identifying SSCs that are within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(1), (a)(2), and (a)(3)

- Section 2.2, “Plant Level Scoping Results,” Section 2.3, “System Scoping and Screening Results: Mechanical Systems,” Section 2.4, “Scoping and Screening Results: Structures,” and Section 2.5, “Scoping and Screening Results: Electrical,” to ensure that the applicant described a process for determining structural, mechanical, and electrical components at the FNP 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 SNC corporate offices in Birmingham, Alabama, from November 18–21, 2003. 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 application and the requirements of the Rule. The audit team reviewed implementation procedures and engineering reports describing the applicant’s scoping and screening methodology. In addition, the audit team conducted detailed discussions with the applicant on the implementation and control of the License Renewal Program and reviewed administrative control documentation and selected design documentation used by the applicant during the scoping and screening process. The audit team reviewed the applicant's processes for quality assurance with respect to development of the LRA and training and qualification of the LRA development team. The audit team also reviewed a sample of system scoping and screening results reports for the residual heat removal/low head safety injection, auxiliary feedwater (AFW), main steam, and open-cycle cooling water systems, to ensure that the applicant had appropriately implemented the methodology outlined in the administrative controls and that the results were consistent with the CLB. The audit team documented its review in an audit report issued on September 8, 2004 (ML042520177). The report identified several issues which required additional information from the applicant prior to completion of the review effort. Each of these issues is identified and addressed in detail in Section 2.1 of this SER.

2.1.3.1 Scoping Methodology

The audit team reviewed implementation procedures and engineering reports describing the scoping and screening methodology implemented by the applicant. These SNC procedures include “License Renewal Plant Farley Scoping Procedure,” SP-LR-2-2, Version 2.0; “License Renewal Plant Farley Boundary Procedure,” SP-LR-2-4, Version 2.0; “License Renewal Plant Farley Screening Procedure,” SP-LR-2-5, Version 2.0; “License Renewal Plant Farley Database Control Procedure,” SP-LR 2-9, Version 3.0; and “License Renewal Plant Farley Definitions and References Procedure,” SP-LR 2-1, Version 2.0.

The team found that the scoping and screening methodology instructions were consistent with Section 2.1 of the LRA and were of sufficient detail to provide the applicant with concise guidance on the scoping and screening implementation process to be followed during the LRA activities. In addition to the implementing procedures, the audit team reviewed supplemental design information including system functional descriptions, system drawings, and selected licensing documentation, which the applicant relied upon during the scoping and screening phases of the review. The team found 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.

The audit team reviewed the quality assurance controls used by the applicant to provide reasonable confidence that the LRA scoping and screening methodologies were adequately implemented. The audit team determined that the applicant utilized the following quality assurance processes during the LRA development:

(1) Implementation of the scoping and screening methodology was governed by written procedures and guidelines.

(2) The applicant developed a formal database for documenting license renewal information identified during scoping and screening evaluations. This database was considered the formal quality records of the LR implementation process, and was controlled in accordance with written instructions. Access to the database was strictly controlled.

(3) All final scoping and screening information was developed by a lead technical staff member and independently reviewed by an additional technical staff member prior to being reviewed and approved by the program manager.

(4) The scoping results were reviewed by an independent expert committee comprised of senior experienced members of the Southern Company corporate engineering staff and Farley Nuclear Plant personnel.

(5) The applicant conducted two nuclear quality assurance assessments of the process to develop the LRA to validate the implementation process and the technical accuracy of the application.

The audit team concluded that these quality assurance activities provided additional assurance that LRA development activities were performed consistently with the LRA development guidance descriptions.

The audit team reviewed the applicant's implemented training process to ensure the guidelines and methodology for the scoping and screening activities would be performed in a consistent and appropriate manner. The applicant's LRA team consisted of several engineers who had gained previous license renewal experience working on the Hatch Nuclear Plant (HNP), Units 1 and 2 LRA. This team was supplemented with additional staff from the SNC that were provided with license renewal specific training prior to performing license renewal activities. The purpose of the training was to provide a framework for ensuring that the applicant's staff assigned to the technical portion of the license renewal application acquired a fundamental level of knowledge of the license renewal process and regulatory requirements. The training program consisted of on-the-job training and mentoring provided by engineers with prior HNP LRA experience, supplemented by self-study of selected documents, and lectures by those experienced in various LRA topics. On-the-job-training consisted of senior engineers mentoring the less-experienced staff members on the implementation process, as described in written instructions, associated with scoping, screening and boundary development. The applicant's license renewal team also developed an index of applicable license renewal documentation, including industry and regulatory guidance, which the license renewal staff members were required to read and sign acknowledging that they completed their self-study. Engineers with prior experience on the HNP LRA preparation provided lectures on such topics as, scoping, electrical spaces approach, Aging Management Programs (AMP), boundaries, screening, Aging Management Reviews (AMRs), and Time-Limited Aging Analysis (TLAA). A comprehensive training qualification record for each staff member was compiled and maintained by the applicant as part of the application development process.

The audit team reviewed completed qualification and training records of several of the applicants license renewal staff, including both experienced and non-experienced members, that performed scoping and screening activities. The audit team did not identify any adverse findings. Additionally, based on discussions with the applicant's license renewal personnel during the audit, the team determined that the applicant's license renewal staff were knowledgeable on the license renewal process requirements and the specific technical issues within their areas of responsibility.

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

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

In part, 10 CFR 54(a)(1) requires that the applicant consider all safety-related SSCs that are relied upon to remain functional during and following DBEs to ensure the following functions:

- the integrity of the reactor coolant pressure boundary
- the ability to shut down the reactor and maintain it in a safe-shutdown condition
- the capability to prevent or mitigate the consequences of accidents which 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 to be within the scope of license renewal

The NRC audit team found that the applicant appropriately incorporated the pertinent safety-related SSCs into the scope of its License Renewal Program. The applicant did not rely on its plant component Q-List as a starting point for identifying SSCs within the scope of the Rule. Instead, the applicant developed an exhaustive list of plant functions with information acquired from reviews of various FNP CLB source documents. Principal among those sources was the updated final safety assessment report (UFSAR), technical specifications, documents related to scoping for implementation of 10 CFR 50.65, the Maintenance Rule, and those documents related to the FNP probabilistic risk assessment (PRA) model. Additional information sources included docketed licensing correspondence, design information related to various plant systems, and technical position papers.

The applicant’s approach to satisfying the scoping requirements of 10 CFR 50.54(a)(1) was to identify all safety-related intended functions required to be performed by the FNP units and to subsequently identify the plant systems necessary to perform those intended functions. To accomplish this, the applicant added more documentation to the review, including functional system descriptions, which document the functional requirements and bases of FNP systems, and plant drawings, which are useful for detailing the extent of necessary scope, the equipment to be included therein, and spatial relationships. Additionally, the applicant developed a report, “Review of Non-Chapter 15 FSAR Design Basis Events for Additional SSCs In-Scope for License Renewal,” which detailed a composite list of FSAR events to assist in identifying system intended functions and systems credited with mitigation of those events. The audit team reviewed the report and discussed it with the applicant. The team found the report to contain a concise and detailed evaluation of approximately 40 events along with appropriate supporting references to CLB documentation.

In accordance with license renewal procedure SP-LR 2-2, an expert panel reviewed the results of the scoping process. The expert panel approach was effective in the development and evaluation of safety-related functions.

As part of the review of the applicant's scoping methodology, the audit team reviewed a sample of the license renewal database 10 CFR 54(a)(1) scoping results, reviewed a sample of the scoping result reports to support these reviews, and discussed the methodology and results with the applicant's personnel who were responsible for these evaluations.

Conclusion

The audit team reviewed a sample of the license renewal database 10 CFR 54.4(a)(1) scoping results and discussed the methodology and results with the applicant's license renewal project personnel. The team determined that the applicant had identified and used pertinent engineering and licensing information to identify the SSCs required to be in scope in accordance with the 10 CFR 54.4(a)(1) criteria. Therefore, on the basis of this sample review, discussions with the applicant, and review of the applicant's scoping process, the staff determined that the applicant's methodology for identifying systems and structures meeting the scoping criteria of 10 CFR 54.4(a)(1) was adequate.

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

In part, 10 CFR 54(a)(2) requires that the applicant consider all nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54(a)(1)(i), 10 CFR 54(a)(1)(ii), or 10 CFR 54(a)(1)(iii) to be within the scope of license renewal. By letters dated December 3, 2001, and March 15, 2002, the NRC issued a staff position to the NEI which provided staff expectations for determining what SSCs meet the 10 CFR 54.4(a)(2) criterion. The December 3, 2001 letter (ADAMS Accession No. ML013380013) provided specific examples of operating experience which identified pipe failure events (summarized in Information Notice (IN) 2001-09, "Main Feedwater System Degradation in Safety-Related ASME Code Class 2 Piping Inside the Containment of a Pressurized Water Reactor") and the approaches the NRC considers acceptable to determine which piping systems should be included in scope based on the 10 CFR 54.4(a)(2) criterion. The March 15, 2002 letter (ADAMS Accession No. ML020770026) further described the staff's expectations for the evaluation of nonpiping SSCs to determine which additional nonsafety-related SSCs are within scope. The position states that applicants should not consider hypothetical failures, but rather should base their evaluation on the plant's CLB, engineering judgement and analyses, and relevant operating experience. The paper further describes operating experience as all documented plant-specific and industrywide 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 SOERs, and engineering evaluations.

The applicant documented its methodology for performing 10 CFR 54.4(a)(2) scoping of nonsafety-related SSCs in the implementation procedure "Scoping Methodology for Non Safety-Related Equipment that Could Affect Safety-Related Equipment, 10 CFR 54.4(a)(2)." The procedure described the current regulation and the interim staff position regarding scoping of SSCs with respect to the 10 CFR 54.4(a)(2) criteria, and the applicant's methodology, discussion, and results regarding scoping in accordance with the Rule criteria. The report specifically states that for mechanical systems and components, the potential for meeting the 10 CFR 54.4(a)(2) criteria exists for both connected and nonconnected NSR SSCs. The applicant evaluated the following five categories of NSR mechanical components:

(1) NSR piping attached to SR piping

(2) high-energy NSR piping

(3) low-energy NSR piping that has a spatial relationship to SR SSCs

(4) piping that is used for relief valve flowpaths and SR pump recirculation paths

(5) floor drain traps and plugs that support the maintenance of the PRFS pressure boundary

In keeping with the NEI draft position on NSR SSCs that could adversely affect SR SSCs, SNC used a process to identify SR targets and NSR threats in a given area of FNP. To determine the potential for interaction between credible threats and valid targets, the applicant used the piping physical layout drawings for NSR systems in combination with electrical equipment layout and instrument layout drawings. Where an NSR pipeline or component was located in the same room or area as an SR electrical component, that room was identified for later walkdown. The applicant listed these potential interactions and performed walkdowns for rooms with potential interactions.

In those cases where the applicant identified a credible interaction, the applicant recorded that potential interaction for further evaluation to determine if that interaction could affect the SR component. If this evaluation found a potential adverse affect on an SR component, the NSR SSC was brought into scope.

For mechanical components, the applicant created a set of separate functions to account for the NSR mechanical components. The following five functions are in scope only for criterion 10 CFR 54.4(a)(2):

(1) F050—attached piping
(2) F051—high-energy lines
(3) F053—NSR SSCs spatial interaction with SR SSCs
(4) F054—pump recirculation and safety relief valve vent paths
(5) F056—PRFS pressure boundary drain traps and plugs

The applicant presented the results of this review in tables within the report and appended the license renewal database to include those components brought into scope as a result of the review.

On the basis of its review of the LRA, the applicant's scoping and screening implementation procedures, and discussions with the applicant during audit conducted from November 18 to November 21, 2003, the staff determined that it needed additional information to assess certain aspects of the applicant's evaluation of the 10 CFR 54.4(a)(2) criteria. By letter dated December 12, 2003, the staff requested additional information regarding the scoping methodology associated with the 10 CFR 54.4(a)(2) evaluation. This was request for additional information (RAI) 2.1-1. In RAI 2.1-1, the staff asked the applicant to address the following five issues:

(1) the basis for use of proceduralized criteria that could exclude certain NSR equipment from the scope of license renewal (e.g., NSR equipment could be excluded from scope if it is more than 20 feet away from an SR electrical component)

(2) the use of operating experience for determining that certain gas-filled SSC failures were not credible

(3) the basis and/or justification for limiting the valid target to only an electrical SR SSC

(4) the basis for considering NSR components up to (emphasis added) the next equivalent seismic anchor (or physical restraint in the third direction) to be within the scope of 10 CFR 54.4(a)(2) and evaluated for the effects of aging management, and clarification as to whether the seismic anchor itself is within scope

(5) the basis for not including a portion of the NSR piping (3-in. HCC-321 attached to valve QV-791B) in the service water system which appeared to meet the initial scoping criteria for attached NSR piping described in the LRA position paper "License Renewal Position Evaluation and Disposition," but was not included within the scope of license renewal

The applicant responded to the staff's RAI in letters dated January 9, 2004, March 31, 2004, and April 16, 2004. In addition, the staff held conference calls with the applicant on February 5, 2004, March 1, 2004, and March 18, 2004, to clarify the responses to the RAI. In its letter dated January 9, 2004, the applicant initially replied to each of the staff's requests.

With respect to the first issue regarding the basis for the 20-foot criteria, the applicant stated that the primary basis for the criteria was discussions within the industry that considered 20 feet to be an acceptable distance for spray effects from low-energy pipes. In most cases, the 20-foot criteria encompassed the entire confines of a room where SR and NSR SSCs were located. However, notable exceptions included the heat exchanger rooms, the corridors, the mechanical penetration rooms, and the lower equipment room within the auxiliary building. In most cases, the SR and NSR equipment in these rooms were in fact brought into scope because they met one of the other scoping criteria.

The staff reviewed the applicant's response, concluded that the applicant did not provide sufficient rationale for the use of the 20-foot criteria, and requested the applicant to provide a technical basis for the criteria or review its approach and determine if additional SSCs should be included in scope. As a result, the applicant revised its scoping methodology to remove the 20-foot criteria and performed a supplemental scoping review based on a spaces approach. By letter dated April 16, 2004, the applicant described the revised scoping methodology based on the spaces approach. The staff reviewed this response and finds that it adequately addresses the potential for interaction between NSR and SR SSCs, consistent with the staff's position described above. Specifically, the applicant stated that it will consider all fluid-filled NSR SSCs to be in scope if those NSR SSCs are located in the same space as the SR SSCs. For the purposes of the review, a space was defined as the room in which the SR and NSR components are located. In addition, if the SR SSC is determined not to be vulnerable to the effects of spray or leakage, then the NSR SSC of interest would not be brought into scope because it could not prevent or adversely affect the SR component's performance of its safety function. In broadening its scoping evaluation approach, the applicant also will consider the impact of NSR fluid-filled SSCs on both mechanical and structural SR SSCs in addition to the active electrical components already considered within its 10 CFR 54.4(a)(2) evaluation. As a result of the revised 10 CFR 54.4(a)(2) methodology, the applicant brought into scope additional NSR SSCs and provided AMR information for each. Sections 2.2 and 3 of this SER evaluate these topics.

With respect to the second issue regarding the identification of the nonfluid-filled systems evaluated and the operating experience applied to the evaluation, the applicant stated that it conducted the review in accordance with the staff's guidance and included both nonfluid-filled piping and ductwork SSCs. The applicant considered the operating environment for each of these SSCs and reviewed the plant's CLB and plant-specific and industrywide operating experience (i.e., NRC generic communications, industry reports, and the plant-specific corrective action database) to determine if any credible aging effects resulting in failures of these SSCs could impact the SR SSCs in proximity.

The staff reviewed the applicant's response and concluded that the applicant had adequately described its process for evaluating the potential for nonfluid-filled SSCs to cause the failure of SR SSCs. This description is consistent with the staff's position regarding the scoping of SSCs in accordance with the requirements of 10 CFR 54.4(a)(2) described above.

With respect to the third issue regarding limiting the valid target to only an electrical SR SSC, the applicant stated that it had performed an evaluation to determine if mechanical or structural components were susceptible to failures from dripping or spraying of oil or water and had not identified any such failures. The applicant stated that this assessment was also based on the assumption that any such spraying or dripping on mechanical or structural SSCs would be limited in duration because visual identification of the spray or leakage was likely before it would pose a failure concern.

The staff reviewed the applicant's response and concluded that the applicant did not provide an adequate justification for limiting targets to electrical SSCs only. As part of the review, the staff asked the applicant to provide additional justification for the determination that mechanical and structural SSCs would not be susceptible to such effects or perform a supplemental evaluation to determine what, if any, additional NSR SSCs should be brought into scope. Specifically, the staff requested that the applicant provide a basis showing that the mechanical and structural SSCs were qualified to withstand the environment created as a result of the spray or dripping of such fluids and provide the rationale for the assumption that any such exposure would be limited in duration.

As a result, the applicant revised its scoping methodology to consider both mechanical and structural SR SSCs as potentially valid targets, and it performed a supplemental scoping review based on this criteria. By letter dated April 16, 2004, the applicant described the revised scoping methodology. The staff reviewed this response and finds that it adequately addresses the potential for interaction between NSR and SR SSCs and is consistent with the staff's position described above. As a result of the revised 10 CFR 54.4(a)(2) methodology, the applicant brought into scope additional NSR SSCs and provided AMR information for each. Sections 2.2 and 3 of this SER evaluate these topics.

With respect to the fourth issue regarding the basis for considering NSR components up to the next equivalent seismic anchor (or physical restraint in the third direction) to be within the scope of 10 CFR 54.4(a)(2) and clarification as to whether the seismic anchor itself is within scope, the applicant stated that the seismic anchor (as defined) is included within scope. Additionally, the applicant determined that the use of the equivalent anchor point determined to be a physical restraint in the third cardinal direction is consistent with the CLB and the seismic analysis pertaining to FNP, Units 1 and 2. Specifically, the applicant reviewed and established that the plant seismic analysis confirmed that the NSR SSCs (including piping and any in-line component) necessary for the qualification of the SR piping was included within that portion of the piping systems up to the physical constraint in the third direction. As an additional assurance that SR SSCs would be preserved during a seismic event, the applicant also placed within scope all piping supports and anchors within all seismic Category 1 buildings, regardless of the safety classification of those components.

The staff reviewed the applicant's response and concluded that the applicant had adequately described its process for establishing the next equivalent seismic anchor consistent with the CLB and the seismic analysis pertaining to FNP, Units 1 and 2, and the staff's position regarding the scoping of SSCs in accordance with the requirements of 10 CFR 54.4(a)(2) described above.

With respect to the final issue regarding the basis for not including a portion of the NSR piping (3-in. HCC-321 attached to valve QV-791B) in the service water system which appeared to meet the initial scoping criteria for attached NSR piping described in the LRA position paper "License Renewal Position Evaluation and Disposition," the applicant stated that the portion of piping identified by the audit team was in fact within the scope of license renewal although it was not highlighted on the working drawing to reflect this. Additionally, the applicant reviewed the system boundary drawings to assure that the remaining attached NSR piping was properly captured within scope. By letter dated March 31, 2004, the applicant confirmed that the portion of NSR piping was in scope in accordance with its 10 CFR 54.4(a)(2) evaluation.

The staff reviewed the applicant's response and concluded that the applicant did include the portion of NSR piping within scope and determined that the remaining attached piping was properly evaluated in accordance with its initial scoping criteria.

Conclusion

As part of the review of the applicant's scoping methodology, the audit team also reviewed a sample of the license renewal database 10 CFR 54(a)(2) scoping results to determine if the scoping methodology adequately identified nonsafety-related SSCs meeting the scoping criteria of 10 CFR 54.4(a)(2). On the basis of the additional information supplied by the applicant, including expansion of the systems within the scope of license renewal and addition of new portions of systems within scope as a result of the revised methodology, determination of the credible failures which could impact the ability of safety-related SSCs to perform their intended functions, evaluation of relevant operating experience, incorporation of identified nonsafety-related SSCs into the applicant's AMPs, and the results of NRC inspection and audit activities, the staff concludes that the applicant has supplied sufficient information to demonstrate that all SSCs that meet the 10 CFR 54.4(a)(2) scoping requirements have been identified as being within the scope of license renewal. Therefore, the staff considers RAI 2.1-1 to be closed.

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

In part, 10 CFR 54(a)(3) requires that the applicant consider all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48), EQ (10 CFR 50.49), PTS (10 CFR 50.61), ATWS (10 CFR 50.62), and SBO (10 CFR 50.63) to be within the scope of license renewal.

The applicant documented its methodology for performing the scoping of SSCs in accordance with 10 CFR 54.4(a)(3) in implementation procedure SP-LR-2-2 and the technical position papers developed by the applicant for each regulated event applicable to the FNP, Units 1 and 2.

The applicant performed the initial scoping for regulated events by evaluating CLB information relevant to each regulated event to identify if the structure or system met the scoping criteria of 10 CFR 54.4(a)(3). For each event, the applicant developed a position paper describing the relevant Rule requirements, a functional description of the implementation of that requirement at the FNP, specific information regarding systems and components credited for the event, the process to identify the scoping boundaries associated with the systems credited, the intended functions applicable to the requirement, information on how to record the results of the evaluation in the license renewal database, a list of CLB information sources used for the analysis, and a list of systems and components determined to be within scope for the given regulated event. During the scoping and screening methodology audit, the applicant stated that use of the position papers ensured consistent scoping results and eliminated the need to review CLB documents when evaluating each plant structure or system against the 10 CFR 54.4(a)(3) scoping criteria.

In an April 1, 2002, letter from D. Matthews to A. Nelson and D. Lochbaum, the staff provided guidance on the scoping of equipment relied on to meet the requirements of the SBO rule, 10 CFR 50.63. In this letter, the staff noted that, consistent with the requirements specified in 10 CFR 54.4(a)(3) and 10 CFR 50.63(a)(1), the plant system portion of the offsite power system that is used to connect the plant to the offsite power source should be included within the scope of the Rule. In Section 2.1.3.3.5 of the LRA, the applicant stated that the SBO scoping effort identified structures and components of the offsite power system for each plant required to restore power from the onsite switchyard down to the safety-related busses in the plant. The applicant also stated that the plant offsite power system and these structures and components were classified as satisfying criteria 10 CFR 54.4(a)(3) and were included within the scope of license renewal. The staff determined that the applicant's approach to scoping SSCs relied on to demonstrate compliance with the SBO rule (10 CFR 50.63) was consistent with the staff's April 1, 2002, interim staff guidance.

As part of the review of the applicant's scoping methodology, the audit team reviewed a sample of the license renewal database 10 CFR 54(a)(3) scoping results, reviewed a sample of the analyses and documentation to support these reviews, and discussed the methodology and results with the applicant's personnel responsible for these evaluations. The team determined that the applicant had identified and used pertinent engineering and licensing information in order to determine the SSCs required to be in scope in accordance with the 10 CFR 54.4(a)(3) criteria. Based on this sampling review and discussions with the applicant, the audit team determined that the applicant's methodology for identifying systems and structures meeting the scoping criteria of 10 CFR 54(a)(3) was adequate.

2.1.3.1.2 Plant-Level Scoping of Systems and Structures

The applicant documented its methodology for performing the scoping of SSCs in accordance with 10 CFR 54.4(a) in implementation procedures SP-LR-2-2 and SP-LR-2-4. The applicant's approach to system and structure scoping was consistent with the methodology described in Section 2.1.3 of the LRA. Specifically, SP-LR-2-2 specified that the personnel performing license renewal scoping use CLB documents and list all functions that the system or structure is required to accomplish. Sources of information regarding the CLB for systems included the FSAR, functional system descriptions, total plant numbering system (TPNS) database, Maintenance Rule information, operations lesson plans, plant drawings, PRA model, the SER, and docketed correspondence. The applicant then compared identified system or structure functions to a list of scoping screening questions to determine whether the functions met the scoping criteria of 10 CFR 54.4(a).

The applicant documented the results of the plant-level scoping process in accordance with Appendix A, "Database Scoping Instructions," to SP-LR-2-2. The database scoping form included a description of the structure or system, a listing of functions performed by the system or structure, information pertaining to system realignment (as applicable), identification of intended functions (defined as final 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 scoping methodology audit, the staff reviewed a sampling of scoping reports and concluded that the applicant's scoping forms contained an appropriate level of detail to document the scoping process.

Conclusion

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

2.1.3.1.3 Component-Level Scoping

After the applicant had identified systems and structures within the scope of license renewal and their associated intended functions, a review was performed to identify the components of each in-scope system and structure that supported an intended function. As described in Section 2.1.4 of the LRA, a component was considered to be in scope if it was determined that the component was needed to fulfill a system intended function.

Mechanical Component Scoping

Section 6.0, "Boundary Procedure," of SP-LR-2-4 provided the applicant's proceduralized guidance for scoping mechanical system components. The applicant initially generated a listing of mechanical system components based on information derived from a review of the system license renewal boundary diagrams to identify system components required to perform a system intended function. Procedure SP-LR-2-4 discusses in detail how to (1) determine system boundaries, (2) indicate components within a specific flowpath which are required for performance of intended functions, and (3) determine and identify system and interdisciplinary interfaces (e.g., mechanical/structural, mechanical/electrical, structural/electrical). The audit team reviewed the results of the boundary evaluation and discussed the process further with the applicant. The team determined that mechanical system evaluation boundaries were established for each system within the scope of license renewal. These boundaries were determined by mapping the pressure boundary associated with system-level license renewal intended functions onto the system process and instrumentation diagrams (P&IDs). System components meeting the criteria of 10 CFR 54.4(a) were classified as within the scope of license renewal. Mechanical component types were loaded into a scoping and screening database and further review was performed to ensure all component types were identified. A preparer and an independent reviewer performed a comprehensive evaluation of the boundary drawings to ensure the completeness and accuracy of the review results.

The NRC audit team conducted detailed discussions with the applicant’s license renewal project management personnel and reviewed documentation pertinent to the scoping process. The team assessed whether the applicant had appropriately applied the scoping methodology outlined in the LRA and implementation procedures and whether the scoping results were consistent with CLB requirements.

The audit team reviewed the process of scoping for several mechanical systems. Those systems included the residual heat removal/low head safety injection, AFW, main steam, and open-cycle cooling water systems. The audit team determined that the applicant had identified and highlighted system P&IDs to develop the system boundaries in accordance with the procedural guidance. The applicant was knowledgeable about the process and conventions for establishing boundaries as defined in the license renewal implementation procedures. Additionally, the team determined that the applicant had independently verified the results in accordance with the governing procedures. Specifically, other personnel knowledgeable about the system had independently reviewed the marked-up drawings to ensure accurate identification of system intended functions. The audit team performed additional cross-discipline verification and independent reviews of the resultant highlighted drawings before final approval of the scoping effort.

Conclusion

The staff determined that the applicant’s proceduralized methodology was consistent with the description provided in Section 2.1.4 of the LRA and the guidance contained in NUREG-1800, Section 2.1, and was adequately implemented. On the basis of the applicant’s detailed scoping implementation procedures and a sampling review of mechanical components scoping results, the staff concluded that the applicant’s methodology for identifying mechanical components within the scope of license renewal met the requirements of 10 CFR 54.4(a).

Structural Component Scoping

The licensee performed its structural scoping in accordance with the detailed methodology defined in SP-LR 2-2, “Plant Farley Scoping Procedure.” The scoping procedure is used to evaluate SSCs to identify their functions and determine which functions are intended functions required for compliance with one or more criteria of 10 CFR 54.4(a)(1-3). The applicant identified the structural component intended functions for in-scope SCs based on the guidance provided in NEI 95-10. The procedure also described the source design documentation to be used for the evaluation of structures meeting the 10 CFR 54.4(a)(1-3) criteria. For civil structures, the evaluation boundaries were determined by developing a complete description of each structure. This was accomplished by reviewing design drawings, the FSAR, DBDs, and selected plant walkdowns. The applicant created a Microsoft Access database for use in compiling the scoping results. The four primary forms contained in the database identify potential functions, final functions, system, and function scoping.

The applicant then identified systems and structures that perform each intended function. For 10 CFR 54.4(a)(2) civil SSCs in proximity to SR civil, mechanical, or electrical SSCs, the applicant used a spaces approach to scope SSCs inside SR structures. As an example, all supports in a seismic Category I building are in scope whether or not they are seismic Category I, II/I, or II in design. The applicant considered multiple intended functions for SCs consistent with the staff guidance provided in Table 2.1-3 of NUREG-1800.

For each in-scope structure, the applicant documented a list of the structural components within the evaluation boundaries for the system, identified the component intended functions for the structural components, and identified the applicable design or licensing basis references used to make the determinations. Tables 2.2-1a through 2.2-1f of the LRA provide a complete plant-specific list of FNP systems and structures within the scope of license renewal.

The applicant used license renewal boundary procedure SP-LR-2-4 to define the evaluation boundaries for civil system and structure functions determined to be in the scope of license renewal during performance of FNP scoping procedure SP-LR-2-2. The team reviewed license renewal civil boundary drawing D-170084L, sheet 1, dated August 15, 2003, which shows overall structures (highlighted in red) that contain areas with in-scope structural SSCs. The entire structure associated with an intended function will normally be included in the scope of license renewal. Boundary form SP-LR 2-4, which is part of the FNP electronic database, is then used to identify the TPNS associated with the boundary form. Three people, one in the civil group, one in the mechanical group, and one in the electrical group, verified the civil boundary forms.

The NRC audit team conducted detailed discussions with the applicant’s license renewal project management personnel and reviewed documentation pertinent to the scoping process. The team assessed whether the applicant had appropriately applied the scoping methodology outlined in the LRA and implementation procedures and whether the scoping results were consistent with CLB requirements. The team also reviewed scoping reports for the auxiliary building, containment, and yard structures. In general, the team determined that the applicant’s overall approach to license renewal structural scoping appeared to be adequate.

The audit team reviewed the screening procedure, discussed the structural scoping methodology with the applicant’s cognizant engineers, and reviewed several plant structural drawings to verify proper implementation of the scoping process for structural components. The team also compared a sample of structural components identified in the drawings to the structural list in the license renewal database to ensure consistency. Based on these audit activities, the team did not identify any discrepancies between the methodology documented and the implementation results.

Conclusion

The staff determined that the applicant's proceduralized methodology was consistent with the description provided in Section 2.1.4 of the LRA and the guidance contained in NUREG-1800, Section 2.1. Based on a review of information contained in the LRA, the applicant's detailed scoping implementation procedures, and a sampling review of structural component scoping results, the staff concluded that the applicant's methodology for identifying structural components within the scope of license renewal met the requirements of 10 CFR 54.4(a).

Electrical and I&C Component Scoping

Section 2.5.3.1, "Components Within the Scope of License Renewal," of NUREG-1800 states that an applicant may use the plant spaces approach in scoping electrical and I&C components. In the plant spaces approach, an applicant may indicate that all electrical and I&C components located within a particular area are either within or not within the scope of license renewal. Table 2.5-1, "Examples of 'Plant Spaces' Approach for Electrical and I&C Scoping and Corresponding Review Procedures," of NUREG-1800 provides guidance for the review of scoping performed in accordance with the plant spaces approach. In particular, if the applicant limits the scope of electrical and I&C components considered within the scope of license renewal by excluding components in certain plant spaces, Table 2.5-1 indicates that this approach should not result in failing to place electrical and I&C components that perform intended functions within the scope of license renewal.

The staff reviewed FNP procedure SP-LR-2-5, "License Renewal Plant Farley Screening Procedure," and determined that it provided adequate guidance to the engineers performing I&C reviews. The procedure describes the process to identify the component types that will be subject to AMR and the long-lived, passive component types determined to be within the scope of the license renewal rule. To implement the spaces approach for aging management discussed in Section 4.2.1.1 of NEI 95-10, Revision 3, the applicant based the boundary determination for electrical components on plant location. In the spaces approach, FNP segregated the plant into areas where common bounding environmental parameters can be assigned. The staff reviewed FNP procedure SP-LR-2-4, "License Renewal Plant Farley Boundary Procedure," Version 2.0, and determined that it provided adequate guidance to define evaluation boundaries for electrical functions that should be in the scope of the LRA. The FNP's LRA engineers created a boundary to encompass all electrical components and called the boundary "EC." The applicant established a pseudo system, which it named R99 for the electrical screening process, and documented the results in a boundary form. The staff observed that the applicant had identified all electrical/I&C component types used plantwide, regardless of the system, within the boundary. In the form, the applicant identified the boundary as electrical components (EC) and listed the buildings and structures that are included in the boundary. The applicant also discussed in the form the screening of the components credited in the CLB with supporting the regulated events. The form listed the names of all the systems and the TPNSs that are within the boundary and referenced the drawings from which information was collected. The staff observed that the form identified the names of the preparer and mechanical and electrical verifiers.

The applicant also conducted a search of plant documents, controlled drawings, the plant equipment database, and interface with the parallel mechanical and civil/structural screening efforts to identify all components required to perform license renewal intended functions. For example, the applicant noted that during the review, it found local control panels of in-scope equipment on drawings but not discussed in the FSAR. The applicant then evaluated those panels to see if they met the scoping criteria.

The audit team reviewed the electrical boundary procedure, discussed the electrical scoping methodology with the applicant's cognizant engineers, and reviewed several plant electrical packages to verify proper implementation of the scoping process for electrical components. The team also compared a sample of electrical components identified in the documentation to the electrical commodity list in the license renewal database to ensure consistency. Based on these audit activities, the team did not identify any discrepancies between the methodology documented and the implementation results.

<u>Conclusion</u>

The staff determined that the applicant's proceduralized methodology was consistent with the description provided in Section 2.1.4 of the LRA and the guidance contained in NUREG-1800, Section 2.1. Based on a review of information contained in the LRA, the applicant's detailed scoping implementation procedures, and a sampling review of electrical commodity scoping results, the staff concluded that the applicant's methodology for identifying electrical commodities within the scope of license renewal met the requirements of 10 CFR 54.4(a).

2.1.3.2 Screening Methodology

The staff reviewed the screening methodology used by the applicant to determine if mechanical, structural, and electrical components within the scope of license renewal would be subject to further aging management evaluation. The applicant described its screening process in Section 2.1.4 of the LRA. In general, the applicant's screening approach consisted of evaluations to determine which in-scope structures and components were passive and long-lived. Passive, long-lived structures and components were then subject to further AMR.

The staff evaluated the applicant's screening methodology against the criteria contained in 10 CFR 54.21(a)(1–2) using the review guidance contained in NUREG-1800, Section 2.1.3.2, "Screening." According to 10 CFR 54.21(a)(1), the applicant's IPA must identify and list those structures and components subject to an AMR. Further, 10 CFR 54.21(a)(1) requires that structures and components subject to an AMR shall encompass those structures and components that (1) perform an intended function, as described in 10 CFR 54.4, without moving parts or a change in configuration or properties, and (2) are not subject to replacement based on a qualified life or specified time period. Per 10 CFR 54.21(a)(2), the applicant must describe and justify the methods used to meet the requirements of 10 CFR 54.21(a)(1). In the LRA, the applicant described screening methodologies that were unique to the mechanical, structural, and electrical disciplines. The following sections describe the staff evaluation of the applicant's screening approach for each of these disciplines.

2.1.3.2.1 Mechanical Component Screening

The team reviewed the methodology used by the applicant to determine if mechanical components within the scope of license renewal would be subject to further AMR. For mechanical components, the applicant first established evaluation boundaries for the various plant mechanical systems, as described in Section 2.1.3.1.3 of this SER. The applicant then applied a screening process to each mechanical system in order to determine the types of mechanical components and commodities within the systems which are subject to an AMR, and the various materials and environments to be considered in the AMR.

The listing of mechanical components was facilitated by combining these items into commodity groups from a review of each boundary drawing. The applicant placed these commodity groups into the license renewal database and evaluated them in accordance with the screening criteria described in SP-LR-2-5. The applicant provided the staff with a detailed discussion of the process and provided screening report information from the license renewal database that described the screening methodology, as well as a sample of the screening results reports for a selected group of SR and NSR systems. The audit team determined that the screening methodology was consistent with the requirements of the Rule and that implementation of the methodology is adequate to identify SCs that meet the screening criteria of 10 CFR 54.21(a)(1).

During the audit, the team reviewed the methodology used by the applicant to identify and list the mechanical components and commodities subject to an AMR, as well as the applicant's technical justification for this methodology. The team discussed the methodology and results with the applicant's cognizant engineers and senior staff. The team also examined the applicant's results from the implementation of this methodology by reviewing a sample of the mechanical systems identified as within scope. These systems included the residual heat removal/low head safety injection, AFW, main steam, and open-cycle cooling water systems. The review included the evaluation boundaries and resultant in-scope components, the corresponding component-level intended functions, and the resulting list of mechanical components and commodity groups subject to an AMR.

The team reviewed several summary screening reports which list a breakdown of the mechanical components in scope for license renewal. Each report lists several categories including component type, if an AMR was required, material, and an extensive comment section. The team also reviewed a sample of the mechanical drawing packages assembled by the applicant and discussed the process and results with the cognizant engineers who performed the review. The audit team did not identify any discrepancies between the methodology documented and the implementation results.

Conclusion

The staff determined that the applicant's mechanical component screening methodology was consistent with the guidance contained in NUREG-1800 and was adequate to identify those passive, long-lived components within the scope of license renewal that are subject to an AMR.

2.1.3.2.2 Structural Component Screening

The team reviewed the methodology used by the applicant to determine if structural components within the scope of license renewal would be subject to further AMR. For civil structures and component supports, the applicant applied a screening process to buildings and civil structures determined to be in scope in order to determine the types of structural elements utilized and the various materials and environments to be considered in the AMR. The applicant then established evaluation boundaries for the various plant structures and structure groups within the scope of license renewal. Generally, the boundary for a building or structure is the entire building including base slabs, foundations, walls, beams, slabs, and steel superstructure.

The applicant identified and listed the various types of structural elements, materials, and environments that make up the buildings and structures. Several structural drawings, including screening reports for the auxiliary building, containment, and yard structures, were reviewed to identify any structural components that were not contained in the FNP license renewal database.

The listing of structural elements was facilitated by combining these items into commodity groups. The applicant developed a list of structural commodity groups and components for each civil/structural evaluation boundary. The applicant provided the staff with a detailed discussion of the process and provided technical reports that described the screening methodology, as well as a sample of the screening results reports for a selected group of SR and NSR systems. The audit team determined that the screening methodology was consistent with the requirements of the Rule and that implementation of the methodology was adequate to identify SCs that meet the screening criteria of 10 CFR 54.21(a)(1).

During the audit of the applicant's license renewal scoping and screening process, the team reviewed the methodology used by the applicant to identify and list the structural components and structural commodities subject to an AMR, as well as the applicant's technical justification for this methodology. The team discussed the methodology and results with the applicant's cognizant engineers and senior staff. The team also examined the applicant's results from the implementation of this methodology by reviewing a sample of the auxiliary building plant structures identified as being within scope. The review included the evaluation boundaries (civil boundaries are structures based) and resultant in-scope components, the corresponding component-level intended functions, and the resulting list of structural components and structural commodity groups subject to an AMR.
The team reviewed several summary screening reports which list a breakdown of the structural components in scope for license renewal. The reports reviewed by the team included those for the auxiliary building, containment, and yard structures. Each report lists several categories including component type, if an AMR was required, material, and an extensive comment section. The team also reviewed a sample of the structural drawing packages assembled by the applicant and discussed the process and results with the cognizant engineers who performed the review. The audit team did not identify any discrepancies between the methodology documented and the implementation results.

Conclusion

The staff determined that the applicant's structural component screening methodology was consistent with the guidance contained in NUREG-1800 and was adequate to identify those passive, long-lived components within the scope of license renewal that are subject to an AMR.

2.1.3.2.3 Electrical and I&C Component Screening

The team reviewed the methodology used by the applicant to determine if electrical components within the scope of license renewal would be subject to further AMR. For electrical components, the applicant applied a screening process by identifying electrical commodities within the facility. The LRA engineers identified all electrical and I&C component types in use at FNP based on the listing provided by Appendix B to NEI 95-10, NUREG-1801, and the EPRI Electrical Handbook and from a review of plant documents, controlled drawings, the plant equipment database, and interface with the parallel mechanical and civil/structural screening efforts.

Electrical component types were organized into commodity groups such as breakers, switches, and cables. The applicant assessed those electrical and I&C components that interface with other components, such as electrical racks, panels, frames, cabinets, cable trays, conduit, and their supports in the appropriate mechanical or civil/structural sections. The applicant considered internal wiring, terminal blocks, and connections located inside a breaker cubicle to be parts of the breaker and screened the breaker but not the individual internal parts. The applicant classified components as safety-related if they could prevent or adversely affect a function that meets the criterion of 10 CFR 54.4(a)(1), rather than nonsafety-related per 10 CFR 54.4(a)(2). Using this methodology, the applicant determined that the electrical component types that require an AMR are cables, connectors, buswork, oil-static cables, and various switchyard components. The applicant documented the screening results in the "Summary Screening Report—EC" for electrical/I&C systems.

The team discussed the methodology and results with the applicant's cognizant engineers and senior staff. The team also examined the applicant's results from the implementation of this methodology by reviewing several electrical/I&C commodity samples from the license renewal database. The review concluded that the applicant's staff had consistently applied the screening criteria to identify those electrical/I&C commodity groups subject to an AMR. The audit team determined that the FNP electrical screening process was consistent with criteria in 10 CFR 54.21(a)(1)(ii) and excluded those components or commodity groups that are subject to equipment qualification requirements. The team did not identify any discrepancies between the methodology documented and the implementation results.

The staff also reviewed the applicant's approach to scoping and screening of electrical fuse holders. In license renewal ISG-5, "Identification and Treatment of Electrical Fuse Holders for License Renewal," dated March 10, 2003, the staff stated that, consistent with the requirements specified in 10 CFR 54.4(a), fuse holders (including fuse clips and fuse blocks) are considered to be passive electrical components. Fuse holders would be scoped, screened, and included in the AMR in the same manner as terminal blocks and other types of electrical connections that are currently being treated in the process. This staff position applies only to fuse holders that are not part of a larger assembly, but support SR and NSR functions in which the failure of a fuse precludes a safety function from being accomplished (10 CFR Part 54.4(a)(1) and (a)(2)). As described in Section 2.1.5.5, "Fuse Holders (ISG-05)," of the LRA, fuse holders that were not part of a larger assembly were identified and included in scope in a manner similar to that used for terminal blocks. The team determined that this was consistent with the ISG.

<u>Conclusion</u>

The staff determined that the applicant's electrical and I&C screening methodology was consistent with the guidance contained in NUREG-1800 and was adequate to identify passive, long-lived components within the scope of license renewal that are subject to an AMR.

2.1.4 Conclusion

The staff review of the information presented in Section 2.1 of the LRA, the supporting information in the scoping and screening implementation procedures and reports, the information presented during the scoping and screening methodology audit, and the applicant's responses to the staff's RAIs formed the basis of the staff's safety determination. The staff determined that the applicant's scoping and screening methodology, including its supplemental 10 CFR 54.4(a)(2) review which brought additional nonsafety-related piping segments and associated components into the scope of license renewal, was consistent with the requirements of the Rule and the staff's position on the treatment of nonsafety-related SSCs. On the basis of this review, the staff concludes that the applicant's methodology for identifying the SSCs within the scope of license renewal and the structures and components requiring an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

2.2 Plant-Level Scoping Results

2.2.1 Introduction

The SOC for the license renewal rule (60 *Federal Register* (FR) 22478) indicates that an applicant has the flexibility to determine the set of SSCs for which an AMR is performed. In LRA Section 2.1, the applicant described the methodology for identifying the SSCs within the scope of license renewal. In LRA Section 2.2, the applicant used the scoping methodology to determine which of the SSCs are required or not required to be included in the scope of license renewal. The staff reviewed the plant-level scoping results to determine whether the applicant had properly identified all plant-level SSCs relied upon to mitigate DBEs, as required by 10 CFR 54.4(a)(1), or whose failure could prevent satisfactory accomplishment of any of the safety-related functions, as required by 10 CFR 54.4(a)(2), as well as the SSCs relied on in safety analysis or plant evaluations to perform a function that is required by one of the regulations referenced in 10 CFR 54.4(a)(3).

The staff reviewed the SSCs that the applicant did not identify as being within the scope of license renewal to determine whether they have any intended functions that are within scope. The staff also reviewed selected SSCs that the applicant identified as being within the scope of license renewal to verify that the applicant had properly identified their components within the evaluation boundary that are subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). To determine whether the applicant identified the SSCs that are subject to an AMR, the staff reviewed the components that the applicant did not identify as being subject to an AMR.

2.2.2 Summary of Technical Information in the Application

In LRA Tables 2.2-1a through 2.2-1i, the applicant listed the plant systems and structures and identified those that are within the scope of license renewal and those that are not within the scope of license renewal. Based on the DBEs considered in the plant's CLB for the safety-related SSCs, the CLB information relating to non-safety-related SSCs, and certain regulated events, the applicant identified those plant-level systems and structures within the scope of license renewal, as defined in 10 CFR 54.4.

Tables 2.2.1a through 2.2.1f of the LRA list the systems and structures that the applicant determined to be within the scope of license renewal, as follows:

- Table 2.2-1a, "Systems and Structures within the Scope of License Renewal—Reactor Coolant System"

- Table 2.2-1b, “Systems and Structures within the Scope of License Renewal—Engineered Safety Features”

- Table 2.2-1c, “Systems and Structures within the Scope of License Renewal—Auxiliary Systems”

- Table 2.2-1d, “Systems and Structures within the Scope of License Renewal—Steam and Power Conversion Systems”

- Table 2.2-1e, “Systems and Structures within the Scope of License Renewal—Structures and Component Supports”

- Table 2.2-1f, “Systems and Structures within the Scope of License Renewal—Electrical Components”

Section 2.3 of the LRA describes the mechanical systems listed in Tables 2.2-1a through 2.2-1d; Section 2.4 describes the structures listed in Table 2.2-2d and Table 2.2-1e; and Section 2.5 describes the electrical and I&C components listed in Table 2.2-1f. The applicant identified 37 mechanical systems, 9 structures, and 22 electrical and I&C systems within the scope of license renewal.

Tables 2.2-1g, 2.2-1h, and 2.2-1i list the mechanical systems, structures, and electrical I&C systems, respectively, that the applicant determined not to be within the scope of license renewal. The applicant originally identified 27 mechanical systems, 25 structures, and 27 electrical and I&C systems that are not within the scope of license renewal.

In its response to RAI 2.1-1 (discussed in Section 2.1 of this SER), the applicant changed the methodology used for determining the portions of non-attached, non-safety-related piping that are within the scope of license renewal, in accordance with 10 CFR 54.4(a)(2). By letter dated April 16, 2004, the applicant stated the following:

> SNC [Southern Nuclear Company] will consider all fluid-bearing NSR [non-safety-related] SSCs to be in the scope of the criterion of 10 CFR 54.4(a)(2), provided the NSR components are located in the same space as the SR [safety-related] SSCs. In addition, if the SR SSC is determined to not be vulnerable to the effects of the spray/leakage, then the NSR SSC would not be in the scope of the Rule [license renewal] since the NSR SSC could not prevent or adversely affect the SR SSC from performing its safety related function. The revised methodology will include evaluating the impact of sprays and leaks on mechanical and structural SR SSCs, as well as electrical SR SSCs, with no limitations on the duration of the sprays/leaks.

By letter dated June 4, 2004, the applicant submitted the supplemental information associated with the determination of SSCs within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(2) as a result of the above changed scoping methodology (see Enclosure 2, “Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4 (a)(2)”).

In Enclosure 2 to the letter, the applicant stated that it had broadened the methodology used for scoping non-attached non-safety-related piping in accordance with 10 CFR 54.4(a)(2) in the following manner:

- elimination of any distance criteria for excluding a spatial interaction between safety-related and non-safety-related SSCs

- further evaluation of spatial interaction effects on mechanical and structural safety-related SSCs (i.e.,valid target considerations not limited to electrical SSCs)

The methodology change resulted in a small change in the number of systems within the scope of license renewal as required by 10 CFR 54.4(a)(2). The applicant added the roof drains and sanitary drains systems to the scope of license renewal and incorporated them into the liquid waste and drains (LW&Ds) system. The methodology change did not result in any systems being removed from scope that had been previously identified as within the scope of license renewal. Therefore, the number of mechanical systems not within the scope of license renewal was reduced to 25 systems.

The methodology change also increased the mechanical SSCs within the scope of license renewal for the open-cycle cooling water, closed-cycle cooling water, demineralized water, potable and sanitary water, reactor makeup water storage, chemical and volume control, feedwater, and the LW&Ds systems. The applicable section for each of these systems discusses the impact of the 10 CFR 54.4(a)(2) scoping methodology changes on the AMR results.

2.2.3 Staff Evaluation

In LRA Section 2.1, the applicant described its methodology for identifying the structures and systems that are within the scope of license renewal and subject to an AMR. The staff reviewed the scoping and screening methodology and provided its evaluation in Section 2.1 of this SER. As addressed in the applicant's response to RAI 2.2-1 dated April 16, 2004, the applicant changed the methodology used for scoping non-attached non-safety-related piping in accordance with 10 CFR 54.4(a)(2). To verify that the applicant properly implemented its methodology, the staff focused its review on the implementation results as shown in LRA Tables 2.2-1a through 2.2-1i to confirm that the applicant omitted no plant-level systems and structures within the scope of license renewal.

The staff determined whether the applicant properly identified the structures and systems within the scope of license renewal in accordance with 10 CFR 54.4. The staff reviewed selected structures and systems that the applicant identified as not falling within the scope of license renewal to verify whether they have any intended functions that do fall within the scope of license renewal. The staff conducted its review of the applicant's implementation in accordance with the guidance described in Section 2.2, "Plant Level Scoping Results," of the SRP-LR (NUREG-1800).

The staff sampled the contents of the FSAR based on the listing of systems and structures in LRA Tables 2.2-1g through 2.2-1i to determine whether any systems or structures that may have intended functions as defined by 10 CFR 54.4 were not included within the scope of license renewal.

In reviewing LRA Section 2.2, the staff identified areas in which it needed additional information to complete the evaluation of the applicant's plant-level scoping results. Therefore, by letter to the applicant dated December 12, 2003, the staff issued RAI 2.2-1, RAI 2.2-2, RAI 2.2-3, and

RAI 2.2-4 and, by letter dated March 23, 2004, the staff issued RAI 2.2-5, concerning the specific issues related to whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21(a)(1). The following paragraphs describe the staff's RAIs and the applicant's responses.

<u>RAI 2.2-1</u>

In a comparison of the FNP units, the staff found that the FNP LRA did not identify the design differences in the systems and components between FNP Unit 1 and Unit 2. Section 1.1.2 of the FNP FSAR states that "the two units are essentially the same, and the descriptions of one unit are interpreted as applying to both units. Differences between the two units, and particularly structures, systems, and components which are shared between the two units, are specifically pointed out." Section 1.2.2 of the FSAR lists the systems, spaces, and equipment shared by the two units. A preliminary comparison of the Unit 1 and Unit 2 license renewal boundary drawings for certain systems indicated that corresponding components considered within the scope of license renewal for one unit were considered out of scope for the other unit. As an example, the primary temperature elements (TEs) 2293I and 2293J were considered within scope on license renewal boundary drawing D-175007L (Unit 1) but out of scope on license renewal boundary drawing D-205007L (Unit 2).

The staff requested that the applicant describe the design differences between the systems and components, together with the associated CLBs for Units 1 and 2, and explain how it has addressed these differences in the scoping and screening review process for the corresponding systems of the two units.

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

By letter dated January 9, 2004, the applicant responded that there is no difference between TEs 2293I and 2293J of the two units. The loop 2293 TEs are strap-on devices for both units and do not penetrate the pressure boundary of the auxiliary feedwater system piping. The TEs are electrical components. Therefore, their scoping review was performed as part of the electrical component evaluation described in LRA Section 2.5.1. As such, TE-2293A through TE-2293L should not have been highlighted on the Unit 1 license renewal boundary drawing D-175007L.

With regard to how the applicant addressed design differences between Unit 1 and 2 systems and components and the associated CLBs in the scoping and review process, Section 2.1 of the LRA describes the applicant's methodology. The applicant stated that a primary source of information used in scoping was the FSAR.

Section 1.1.2 of the FSAR states that the two units are essentially the same, and germane differences between the two units are identified. Section 1.2.2 of the FSAR also provides a summary listing of the spaces and equipment shared by the two units. In its response, the applicant also identified and listed the system functional differences that apply to one unit and not to the other and pointed out the additional unit differences identified on the license renewal boundary drawings.

Based on its review, the staff finds the applicant's response to RAI 2.2-1 acceptable, with regard to describing the Unit 1 and Unit 2 design differences because it adequately identifies LRA and

FSAR sections that address these differences and how the applicant dealt with them in the scoping and screening review process. The applicant also adequately identified the two units' system-level functional differences and the differences between the two units that are shown on the license renewal boundary drawings. Therefore, the staff considers RAI 2.2-1 resolved.

RAI 2.2-2

According to the legend for license renewal boundary drawing D-506450L, components within the scope of license renewal are highlighted in red. A comparison of component types subject to an AMR (listed in LRA Section 2 tables) with those highlighted on the license renewal boundary drawings shows that many of the components highlighted in red (i.e., pressure instrumentation) are not subject to an AMR; that is, these components were screened out. The LRA does not provide another means of identifying the specific components within the component types (or groups) subject to an AMR. Such an identification would have provided the end results of the scoping and screening review process. The staff needs this information to determine whether the specific components (which make up the component types) are properly identified as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff requested that the applicant provide documentation, in the form of either tables or additional drawings, to identify the specific components (constituting the component types) that are within the scope of license renewal and subject to an AMR.

Applicant's Response and Staff's Evaluation

By letter dated January 9, 2004, the applicant referenced LRA Section 2.1.4 in stating that component types used in the FNP IPA include the use of commodity groups where appropriate, and that the commodity groups utilized are similar to those presented in NEI 95-10, Revision 3, and Table 2.1-5 of NUREG-1800, and those used by previous applicants.

The applicant further stated that 10 CFR 54.21(a)(1) requires the LRA to identify only those systems, structures, and components subject to an AMR for those SSCs within the scope of license renewal. In addition, NUREG-1800 and Regulatory Guide (RG) 1.188 accept the use of commodity groups for presenting this information. There is no requirement, nor is it necessary in the scoping and screening process, to list the specific components that the component types for each system comprise. The LRA scoping section for each system presents the component types for a given system or structure subject to an AMR in tabular form.

In response to the staff's request to identify the specific components within the component types subject to an AMR, the applicant provided tables which list the component types with examples of the components/items that make up each component type, the determination of whether the component type is passive and long-lived, and the determination of whether the component type is subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.2-2 acceptable because it adequately identifies the component types used in the FNP IPA and components/items that make up those component types. Therefore, the staff considers the concerns described in RAI 2.2-2 resolved.

RAI 2.2-3

In the FNP LRA, systems are identified by LRA system name. Table 2.2-1 and license renewal boundary drawing D-506450L identify the LRA systems. The LRA systems (which use the LRA system nomenclature) may contain all or part of several FNP systems (which use the traditional FNP nomenclature). On page 2.2-1 of the FNP LRA, the applicant stated that it made this change in nomenclature for ease of review and comparison to NUREG-1801, the GALL Report. However, this nomenclature change created difficulty for the staff in its review of the scoping and screening results, because the FNP FSAR and other CLB documentation refer to systems by the traditional nomenclature. In addition, P&IDs, pipe runs, and components shown on license renewal boundary drawings are labeled using a three- to six-letter abbreviation (system code) based on their traditional system designation.

The staff requested that the applicant provide a complete listing of the traditional nomenclature of FNP systems for both in-scope and out-of-scope systems and system codes used as piping and component identifiers. The staff requested this list so that it could identify which FNP system, if any, is evaluated for the purpose of license renewal.

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

By letter dated January 9, 2004, the applicant responded that SNC chose to package LRA systems in the GALL format using the GALL license renewal system nomenclature as applicable to FNP. For each LRA system, LRA Section 2.2 identifies traditional systems or portions of the traditional systems utilized in the FSAR and other CLB documents.

The applicant stated that the system codes used on the component and pipe run identifiers are based on FNP's total plant numbering system (TPNS). Individual plant systems receive an alphanumeric TPNS designator, and individual components within the system are identified with this designator plus other component-specific coding.

In response to the staff's request for a complete listing of the system codes used as piping and component identifiers, SNC provided FNP drawing D-177558, "Total Plant Numbering System," which shows the system codes used on the component and pipe run identifiers.

Based on its review, the staff finds the applicant's response to RAI 2.2-3 acceptable because it provides the drawing which shows the complete system codes used as piping and component identifiers. This information allows the staff to verify which FNP system is evaluated for the purpose of license renewal. Therefore, the staff considers RAI 2.2-3 resolved.

<u>RAI 2.2-4</u>

License renewal boundary drawing D-506447L identifies by room number the locations where safety-related components that have a potential for damage from a spatial interaction are located for each system. Note 3 of this license renewal boundary drawing states that the systems and rooms as identified contain nonsafety-related components which may be in the proximity of safety-related components.

The staff requested that the applicant provide drawings or descriptive information identifying the rooms by room number. The staff stated that it needs this information to identify the safety-related systems that contain safety-related components which may be adversely impacted by failure of non-safety-related components (brought into the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(2)).

Applicant's Response and Staff's Evaluation

By letter dated January 9, 2004, the applicant clarified that the safety-related SSCs that could be adversely impacted by an age-related failure of nearby non-safety-related SSCs are electrically powered from safety-related power sources. The applicant, in its response to the staff's requests in RAI 2.2-4, provided tables that include room numbers, a room description, FNP system of safety-related SSC, safety-related SSC (target) number, and the safety-related SSC (target) description.

Based on its review, the staff finds the applicant's response to RAI 2.2-4 acceptable because it adequately provides the information required to identify the safety-related systems containing safety-related components which may be adversely impacted by the failure of non-safety-related components. Therefore, the staff considers the concerns described in RAI 2.2-4 resolved.

RAI 2.2-5

By letter dated March 23, 2004, the staff requested that the applicant clarify how the FNP LRA addresses the components listed below. The license renewal boundary drawings show these components as within the scope of license renewal. These components serve the intended function of pressure boundary and are passive and long-lived. However, the LRA tables (e.g., Table 2.3.3.5 for open-cycle cooling water system) as component types subject to an AMR do not list them. The staff requested that the applicant justify the exclusion of the following components from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1):

(a) flexible hoses/connections and flexible joints shown at multiple locations in the open-cycle cooling water, closed-cycle cooling water, and emergency diesel generator (EDG) systems

(b) nitrogen cylinders and air tanks shown on several license renewal boundary drawings

If the nitrogen cylinders are excluded from an AMR because they are subject to replacement as defined in 10 CFR 54.21(a)(1)(ii), the staff requested that the applicant describe the schedule for periodic replacement or the monitoring program and the criteria for replacement if they are replaced on condition.

Applicant's Response and Staff's Evaluation

(a) By letter dated April 22, 2004, the applicant responded that flexible hoses/connections and flexible joints serve the intended function of pressure boundary and are within the scope of license renewal. The flexible hoses/connections and flexible joints in the open-cycle cooling water and closed-cycle cooling water systems are metallic and are encompassed by the component type "piping" in LRA Table 2.3.3.5 for open-cycle cooling water system and in LRA Table 2.3.3.6 for the closed-cycle cooling water system as subject to an AMR.

    The applicant also stated that for the EDG system, the flexible hoses/connections and flexible joints are constructed of elastomers and are within the scope of license renewal but were omitted from the LRA. The applicant concurred that it should have included the component type “flexible connectors” in LRA Table 2.3.3.15 as subject to an AMR with the intended function of pressure boundary. Correspondingly, LRA Table 3.3.2-15 should have included the AMR results.

After reviewing the applicant’s response, the staff concluded that the response did not provide sufficient information to resolve the staff’s concerns. During a telephone conference on May 24, 2004, between SNC and NRC staff, the staff requested that the applicant clarify how similar components are grouped under a component type in the LRA.

By letter dated June 10, 2004, the applicant, in its revised response, stated that flexible hoses/connections and flexible joints in the open-cycle cooling water and closed-cycle cooling water systems are made of carbon and stainless steel, are in scope, and are encompassed by the component type “piping.” These components are constructed of the same materials as piping, exposed to the same internal and external environments, experience the same aging affects, and are managed for aging by the same programs. The component type “piping” is included in LRA Table 2.3.3.5 for the open-cycle cooling water system and LRA Table 2.3.3.6 for the closed-cycle cooling water system with the intended function of pressure boundary. The component type “piping” is also included in LRA Table 3.3.2-5 for the open-cycle cooling water system and LRA Table 3.3.2-6 for the closed-cycle cooling water system. Materials of construction include both carbon steel and stainless steel.

For the EDG system, the applicant explained that the component type “ducts and fittings” includes the stainless steel expansion joints in the intake/exhaust subsystem of the EDG system. The other flexible hoses/connections and flexible joints in the EDG system are constructed of elastomers and are within the scope of license renewal but were omitted from the LRA. Therefore, the applicant concurred that it should have included the component type “flexible connectors” in LRA Table 2.3.3.15 and, accordingly, LRA Table 3.3.2-15 should have included the elastomer flexible connectors.

Based on its review, the staff finds the applicant’s response to RAI 2.2-5a acceptable because the response clarifies that metallic flexible hoses/connections and flexible joints in the open-cycle cooling water and closed-cycle cooling water systems are encompassed by the component type “piping,” agrees that the EDG system flexible hoses/connections and flexible joints should be within the scope of license renewal and subject to an AMR, and clarifies that the stainless steel expansion joints in the intake/exhaust subsystem of the EDG system are included in the “ducts and fittings” component type and are within the scope of license renewal and subject to an AMR. Therefore, the staff considers the concerns described in RAI 2.2-5 resolved.

(b) By letter dated April 22, 2004, the applicant responded that the nitrogen cylinders or bottles are in scope to provide a backup source of pneumatic pressure and are short-lived, as they are subject to replacement based on a qualified life, a specified time period, or because of condition (10 CFR 54.21(a)(1)(ii)). The nitrogen cylinder pressure is monitored daily (every 4 and 8 hours), and, if the pressure has decayed below a specified value, the cylinder is replaced.

For the air tanks that provide a reserve air capacity, the applicant stated that the air tanks within the scope of license renewal are used in various applications and listed in the LRA tables under several component types. In the compressed air and EDG LRA systems (Tables 2.3.3.7 and 2.3.3.15), the component types “air accumulators” and “air receiver” address various air tanks that provide a reserve air capacity for system-level use. The component type “piping” includes some in-line air tanks (because of similarity to piping and other in-line fittings and components) as subject to an AMR.

For the air tanks supplied with the valve operators, the applicant stated that pneumatic valve operators can include air reservoirs or air tanks that are (typically) supplied by the valve vendor and mounted on the valve as part of the valve operator assembly. These air tanks are an integral part of the valve operator, directly support the active function of the operator, and are included as part of the valve operator component for license renewal. The valve operator performs only an active function and therefore is not subject to an AMR. Age-related degradation of the valve operator is managed under the requirements of the Maintenance Rule.

After reviewing the applicant’s response to RAI 2.2-5b, the staff found the applicant’s response for the nitrogen cylinders acceptable, since the response explained that the nitrogen cylinder pressure is monitored daily and the cylinders are replaced if the pressure decays below a specified value. Therefore, these cylinders are short-lived and excluded from being subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

For the air tanks that provide a reserve air capacity, the staff requested, during a telephone conference between the applicant and the NRC staff on May 24, 2004, that the applicant clarify how it groups air tanks under the component type “piping.” The applicant responded that it groups components similar to the pipes that are constructed of the same materials, exposed to the same internal and external environments, experience the same aging affects, and age managed by the same programs under the “piping” component type. Based on this discussion, the staff found its concerns for the air tanks that are provided as a reserve air capacity resolved, since the applicant explained its approach to grouping air tanks under the component type “piping.”

For the pneumatic valve operator air tanks, during a telephone conference between the applicant and the NRC staff on May 24, 2004, the staff agreed to consolidate RAI 2.3.3.5-1a and b, RAI 2.3.4.1-1, and portions of RAI 2.2-5b for the pneumatic valve operator air tanks into a revised RAI 2.2-5b, since the applicant’s responses to these RAIs were all related to the integral parts of valve operators. Therefore, by letter dated May 25, 2004, the staff issued the revised RAI 2.2-5b (consolidated RAI) as follows.

The applicant, in its responses to RAI 2.2-5b, RAI 2.3.3.5-1a and b, and RAI 2.3.4.1-1, stated that air tanks, filters, valves, air reservoirs, and all other components associated with the control valve operators are integral parts of the valve operator and directly support the action function of the operator. The staff agrees that valve operators are active components and are not subject to an AMR. However, the supply air piping and its associated components (pipes, valve bodies, filters, air tanks, air reservoirs, etc.) are passive components and are subject to an AMR.

During a telephone conference on May 24, 2004 between the applicant and the NRC staff, the staff asked the applicant to clarify the following questions about the control valve operators (as examples) Q1P16V562 on A-170059L, Sheet 147; Q2P16V560 on A-200475L, Sheet 47; and HV-3235A/B on D-175033L, Sheet 2:

- The above license renewal boundary drawings show pipes, valve bodies, filters, air tanks, and air reservoirs as separate components and not as integral parts of the valve operator. Provide descriptive information or drawings that show the components that are considered integral parts of the above-mentioned valve operators.

- If the pressure boundary of an operator-associated component is breeched and supply pressure is lost, how will the valve operator perform its intended function of holding the isolation valve at its safe position?

- Is age-related degradation of the components associated with the valve operator managed under the Maintenance Rule? If so, how is the degradation managed?

By letter dated June 18, 2004, the applicant, in its revised response, stated that pneumatic actuators, such as diaphragm and piston-type actuators, perform functions ranging from system isolation (on-off service) to flow or pressure-control type applications. Valve operators (actuators) are classified as active components per NEI 95-10, Revision 3, and therefore are not subject to an AMR. Accessories (subparts) commonly found in actuators include positioners, pressure controllers, volume and pressure boosters, filters, regulators, and solenoid valves. The operators including their subcomponents are maintained, tested, calibrated, etc., as required to assure the proper functioning of the control valve as a unit.

The applicant further explained that the normal compressed air systems are non-safety related, and therefore, the pneumatic actuators are designed fail-safe. Failure position on a loss of air is to the required DBE mitigation position. For pneumatic actuators that must remain functional during a DBE, a backup (emergency) compressed gas supply is provided and included in the scope of license renewal as follows:

- The nitrogen cylinders that provide compressed gas to the pressurizer power-operated relief valves are included in the scope of the compressed air system. The nitrogen cylinders are short-lived and therefore not subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

- The air accumulator tanks that provide backup supply air to the spent fuel pool (SFP) exhaust ventilation to penetration room filtration (PRF) dampers are included in the scope of the compressed air system. The tanks are subject to an AMR and included in the component type “air accumulators” in LRA Table 2.3.3.7.

C The backup supply air to the main steam system atmospheric relief valves is provided by the emergency air compressors and is included in the scope of the compressed air system. The passive components of the emergency air compressor supply (e.g., piping and valve bodies) are subject to an AMR and included in the component types in LRA Table 2.3.3.7. The air compressors are active and therefore are not subject to an AMR.

C The backup supply to the turbine-driven AFW pump steam admission valves (QN12HV3235A and B) is provided by the emergency air compressor system. In addition to the backup air supply from the emergency air compressors, each valve is equipped with an air reservoir with sufficient capacity to open the valves and allow pump operation for 2 hours. These air reservoirs were originally furnished with the valve and actuator and therefore were treated as integral parts of the valve operators for the LRA. In response to this RAI, the applicant determined that the in-scope components upstream of solenoid valves SV-3235A and B (license renewal boundary drawings D-175033L and D-205033L), which include the air reservoirs, should have been included in the compressed air system boundary as part of the backup air supply. The passive components of the backup air supply (e.g., piping, valve bodies, and the air reservoirs) are subject to an AMR and are already included in the component types in LRA Table 2.3.3.7. The air reservoirs are included in the component type “air accumulators.” The air compressors are active and therefore not subject to an AMR.

In regard to the air reservoirs associated with the main steam isolation valves (MSIVs), which were referred to in RAI 2.3.4.1-1, the applicant stated that the MSIV is within the scope of license renewal because it isolates steamflow on a signal initiated by the engineered safety feature (ESF) actuation system. An air reservoir is provided for each MSIV that allows it to remain open upon loss of instrument air. However, keeping the MSIV open is not an intended function within the scope of license renewal. These air reservoirs support this active function of the valve operator and are included in the scope of license renewal as part of the valve operator component. Regardless of whether considered part of the actuator or a separate component, the air reservoir and other highlighted components do not perform any component intended function for license renewal since loss of air supply pressure (e.g., loss of pressure boundary integrity) will close the MSIV which is its required safety position. Maintenance Rule performance criteria are established for the MSIV closure and open flowpath functions.

For the control valves Q1P16V562 and Q2P16V560, the applicant stated that these valves fail to the safe position on loss of the compressed air system air supply. Therefore, the control valve air supplies up to the operator interface are not within the scope of license renewal. Since these valves are fail-safe and are not required to be repositioned during any DBE, the valve operator will perform its intended function if supply pressure is lost or the pressure boundary of an operator-associated component is breeched. For control valve Q1P16V56, pressure controller Q1P16PC562, and unlabeled air tanks, cushion regulator, equalizing valves, check valve, pressure indicators, and pressure regulators are considered as integral parts of the valve operator and are highlighted as within scope. For control valve Q2P16V560 filter N2P16F560; pressure indicators N2P16PI560A, B, and C; equalizing valve N2P16V560A; and unlabeled air tanks, check valve, and pressure regulators are considered as integral parts of the valve operator and are highlighted as within scope. Additionally, instrument air isolation valve N2P19V152C should not have been highlighted.

The applicant also added in its response that, since development of the LRA, a single-acting spring return actuator has replaced the double-acting actuator for valves Q1P16V562 and Q2P16V560. A volume booster has replaced the air tanks for Q1P16V562, and the air tanks for valve Q2P16V560 are eliminated. These changes do not impact the LRA tables, but they do affect the boundary drawings.

The staff reviewed the applicant's revised response and finds it acceptable, on the basis that it adequately identifies the backup air tanks/gas cylinders and other components associated with the valve operators that are within the scope of license renewal, adequately identifies those air tanks/gas cylinders that are subject to an AMR, and adequately justifies exclusion of the air tanks and other components associated with the valve operators from being subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1).

The staff reviewed the applicant's response to RAI 2.1.1 dated April 16, 2004 and its supplemental information related to 10 CFR 54.4(a)(2), dated June 4, 2004 , Enclosure 2, "Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4 (a)(2)." In Enclosure 2, the applicant considered all fluid-bearing non-safety-related SSCs to be in the scope of the criterion of 10 CFR 54.4(a)(2), provided the non-safety-related components are located in the same space as the safety-related SSCs, with the following exceptions:

1. If the safety-related SSC is determined to not be vulnerable to the effects of the spray/leakage, then the non-safety-related SSC would not be in the scope of the license renewal since the non-safety-related SSC could not prevent or adversely affect the safety-related SSC from performing its safety related function.

2. A spray is not postulated for a unpressurized piping system, however a leak is postulated.

3. For a leak from a non-safety-related SSC, the non-safety-related SSC is not routed above safety-related SSCs that are vulnerable to a leak.

4. The revised methodology evaluates the impact of sprays and leaks on safety-related SSCs with no limitations on the duration of sprays or leaks.

5. The applicant relies on the floor drains, floor drain tank, sumps, and associated pumps as mitigative features to control internal flooding and as a method to detect significant leakage resulting from a failed non-safety-related SSC.

6. Non-safety-related SSCs in containment are not evaluated since safety-related SSCs in containment are already qualified for the most limiting post-accident environments, including spray and/or steam.

7. If a non-safety-related SSC does not have an aging effect that requires management, it is excluded from being within the scope of license renewal.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 to be acceptable, on the basis that it adequately identifies all non-safety-related SSCs that are added to the scope of license renewal because of the changed 10 CFR

54.4(a)(2) scoping methodology. The staff did not identify any omissions related to the changed scoping methodology, and thus concludes that the applicant has appropriately identified the structures and systems that are within the scope of license renewal.

2.2.4 Conclusion

The staff reviewed LRA Section 2.2, including the applicant's supplemental information related to 10 CFR 54.4(a)(2), and the supporting information in the FNP FSAR to determine whether the applicant identified all structures and systems within the scope of license renewal. As a result of this review, the staff did not identify any omissions and thus concludes that the applicant has appropriately identified the structures and systems that are within the scope of license renewal, in accordance with 10 CFR 54.4. Sections 2.3 through 2.5 of this SER provide the staff's detailed review of the SSCs that are subject to an AMR.

2.3 System Scoping and Screening Results—Mechanical Systems

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

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

As required by 10 CFR 54.21(a)(1), the applicant must identify and list passive, long-lived mechanical systems and components that are within the scope of license renewal and subject to an AMR. To verify that the applicant properly implemented the scoping and screening methodology, the staff focused its review on the implementation results. This approach allowed the staff to confirm that the applicant had not omitted any mechanical system components that meet the scoping criteria and are subject to an AMR.

Staff Evaluation Methodology

The staff evaluated the information provided in the LRA in the same manner for all mechanical systems. The objective of the review was to determine if the applicant had identified the components and supporting structures for a specific mechanical system that appeared to meet the scoping criteria specified in the rule 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 passive, long-lived components were subject to an AMR, in accordance with 10 CFR 5421(a)(1).

Scoping. The staff reviewed the applicable LRA section and associated component drawings, focusing on components that the applicant had not identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the FSAR, for each mechanical system to determine if the applicant had omitted system components with intended functions delineated under 10 CFR 54.4(a) from the scope of license renewal. The staff also reviewed the licensing basis documents to determine if the LRA specified all intended functions delineated under 10 CFR 54.4(a). When omissions were identified, the staff requested additional information to resolve the discrepancy.

Screening. After completing 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 if the functions are performed with moving parts or a change in configuration or properties, or 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 components that did not meet either of these criteria, the staff sought to confirm that these mechanical system 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.

2.3.1 Reactor Vessel Internals and Reactor Coolant System

In Section 2.3.1 of the LRA, the applicant identified the SCs of the reactor coolant system (RCS) that are subject to an AMR for license renewal. The reactor vessel, internals, and RCS comprise the systems and components designed to contain and support the nuclear fuel, contain the reactor coolant, and transfer the heat produced in the reactor to the steam and power conversion systems for production of electricity.

The applicant reviewed the following approved Westinghouse Owners Group (WOG) generic topical reports as a source of information for determining the SCs that are within the scope of license renewal:

- WCAP-14574-A, "License Renewal Evaluation: Aging Management Evaluation for Pressurizers," December 2000

- WCAP-14575-A, "License Renewal Evaluation: Aging Management Evaluation for Class 1 Piping and Associated Pressure Boundary Components," December 2000

- WCAP 14577-A, Revision 1, "License Renewal Evaluation: Aging Management for Reactor Internals," October 2000

The applicant described the reactor vessel internals and RCS in the following sections:

- reactor vessel
- reactor vessel internals
- reactor coolant system and connected lines
- steam generators

2.3.1.1 Reactor Vessel

2.3.1.1.1 Summary of Technical Information in the Application

In Section 2.3.1.1 of the LRA, the applicant described the reactor vessel. The reactor vessel system boundary includes the reactor vessel itself, along with portions of associated systems that effectively constitute a part of the reactor coolant pressure boundary. These systems include the control rod drive mechanism (CRDM) pressure boundary components and pressure boundary components associated with instrumentation, both in-core flux instrumentation and core-cooling monitoring. The reactor vessel contains the core, core supporting structures, control rods, and other parts directly associated with the core. The upper closure head contains penetrations for CRDMs, thermocouples, reactor vessel level indicating system (RVLIS) instruments, and a head vent.

The vessel shell contains inlet and outlet nozzles located in a horizontal plane just below the reactor vessel flange, but above the top of the core. The bottom head contains penetrations for connection and entry of nuclear in-core instrumentation. Conduits extend from the nuclear in-core instrumentation penetrations down through the concrete shield area and up to a thimble seal table. The conduits and seal table mechanical seals provide the pressure barrier between the reactor coolant and the containment atmosphere.

Table 2.2-1a of the LRA identifies the following criteria used by the applicant to determine the SSCs that are within the scope of license renewal for the reactor vessel:

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))
- pressurized thermal shock (10 CFR 54.4(a)(3))

In Table 2.3.1.1 of the LRA, the applicant identified the reactor vessel component types that are within the scope of license renewal and subject to an AMR, including bottom head torus and dome; bottom mounted instrumentation (BMI) guide tubes; BMI penetrations; core exit thermocouple (CET) and heated junction thermocouple (HJTC) closure assemblies; CET and HJTC assembly bolting; closure head dome and flange, closure studs, nuts, and washers; core support lugs; CRDM and instrumentation housing penetration nozzles; CRDM housing flange adapters; CRDM latch housings and rod travel housings; head vent penetration; intermediate and lower shell courses; leakage-monitoring tube assembly, primary inlet and outlet nozzles and nozzle support pads; primary nozzle safe ends; refueling seal ledge; vessel flange; seal table and fittings; upper (nozzle) shell course; and ventilation shroud support ring.

2.3.1.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.1 and FNP FSAR Sections 5.4, 4.4.5.5, and 7.5.4. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR for any functions delineated under 10 CFR 54.4(a) that the applicant did not identify as intended functions in the LRA; the staff then evaluated that the SSCs with such functions will be adequately managed so that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff next evaluated that the applicant had identified all passive or long-lived components that are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

In its review of LRA Section 2.3.1.1, the staff identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated February 13, 2004, the staff issued an RAI to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated March 12, 2004.

In RAI 2.3.1.1-3, the staff discussed borated water leakage through the pressure boundary in pressurized-water reactors (PWRs), and the resulting borated-water-induced wastage of carbon steel, as a potential aging degradation mechanism for the components. Reactor vessel head lifting lugs are considered to be such components requiring aging management. However, if the applicant currently covers these components under the Boric Acid Wastage Surveillance Program, then additional aging management may not be required. It appeared that the subject components were not discussed in LRA Table 2.3.1.1; therefore, the staff requested the applicant to verify whether these components are within the surveillance program or to explain why they are excluded.

In its response to RAI 2.3.1.1-3, dated March 31, 2004, the applicant stated that the reactor vessel closure head alloy steel lifting lugs are integral to the head and included within the LRA Table 2.3.1.1 component group “closure head dome and flange” and are within the scope of the FNP Borated Water Leakage Assessment and Evaluation Program.

Based on the applicant’s response that the reactor vessel head lifting lugs are included in the LRA Table 2.3.1.1 component group “closure head dome and flange,” and are within scope of the FNP Borated Water Leakage Assessment and Evaluation Program, the staff finds the above response acceptable.

2.3.1.1.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant’s scoping results for reactor vessel components. The staff concludes that the applicant has adequately identified the reactor vessel components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the reactor vessel components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.2 Reactor Vessel Internals

2.3.1.2.1 Summary of Technical Information in the Application

In Section 2.3.1.2 of the LRA, the applicant described the reactor vessel internals. The reactor internals consist of the lower core support structure, the upper core support structure, and the in-core instrumentation support structures. The reactor internals support the core, maintain fuel alignment, limit fuel assembly movement, maintain alignment between fuel assemblies and CRDMs, direct coolant flow past the fuel elements, direct coolant flow to the pressure vessel head, provide gamma and neutron shielding, and provide guides for the in-core instrumentation.

The lower core support structure consists of the core barrel, the core baffle assemblies, the lower core plate, the neutron shield panels, the lower core support forging, the secondary support assembly, and associated support columns. The lower core support structure is supported at its upper flange from a ledge in the reactor vessel, and is restrained at its lower end by a radial support system attached to the vessel wall. The upper core support structure consists of the upper support assembly, the upper core plate, support columns, and control rod guide tube assemblies. The in-core instrumentation support structures consist of an upper system to convey and support thermocouples penetrating the vessel through the upper closure head and a lower system to convey and support flux thimbles penetrating the vessel through the bottom head.

The reactor vessel internals functions include structural support, flow distribution, and radiation shielding. The applicant has further defined these functions to align with those described in WCAP-14577-A, Revision 1.

In Table 2.2-1a of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the reactor vessel internals:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- pressurized thermal shock (10 CFR 54.4(a)(3))

Table 2.3.1.2 of the LRA lists the reactor vessel internals component types that are within the scope of license renewal and subject to an AMR, including baffle and former plates; baffle bolts; BMI column cruciforms; BMI columns; clevis inserts and fasteners; control rod guide tube assemblies; core barrel and core barrel flange; core barrel outlet nozzles; control rod guide tube (CRGT) support pins; flux thimble tubes; head/reactor pressure vessel (RPV) alignment pins; head cooling spray nozzles; HJTC probe holder, probe holder extension, and probe holder shroud assemblies; internals hold down spring; lower core plate and fuel alignment pins; lower support columns; lower support forging; neutron panels; radial support keys and fasteners; secondary core support assembly; upper core plate alignment pins; upper core plate and fuel alignment pins; upper instrumentation conduit and supports; upper support assembly; upper support column bases; and upper support columns.

2.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.2 and FNP FSAR Section 4.2.2. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR for any functions delineated under 10 CFR 54.4(a) that the applicant had not identified as intended functions in the LRA; the staff then evaluated that the SSCs with such functions will be adequately managed so that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff next evaluated whether the applicant had identified all passive or long-lived components that are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

In its review of LRA Section 2.3.1.2, the staff identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated February 13, 2004, the staff issued an RAI to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated March 12, 2004.

In RAI 2.3.1.2-1, the staff requested the applicant to verify whether the component group "neutron panels" listed in LRA Table 2.3.1.2 includes a thermal shield, with an intended function of providing shielding for the safety-related SSCs, such as the reactor vessel and the reactor vessel internals, from gammas and neutrons. A thermal shield may be relied upon to minimize irradiation-induced embrittlement of the vessel and/or the internals. If the component exists at

FNP, the staff requested the applicant to clarify whether thermal shields are included with the “neutron panels” component group or to justify its exclusion from aging management.

In its response to RAI 2.3.1.2-1, the applicant stated that FNP uses a neutron panel shielding design instead of a 360° circumferential thermal shield design. The FNP LRA Table 2.3.1.2 component group “neutron panels” represents several neutron panels strategically located at high-fluence azimuths to reduce the fluence exposure of the FNP reactor vessel beltline materials. These neutron panels are fastened to the exterior of the core barrel and are provided in lieu of a thermal shield. The applicant explained that the term “thermal shield” has typically been used to describe a design that employs a 360° circumferential shield to reduce neutron fluence on the reactor vessel beltline materials.

On the basis of the applicant’s response that the LRA Table 2.3.1.2 component group “neutron panels” represents several neutron panels strategically located at high-fluence azimuths to reduce the fluence exposure of the FNP reactor vessel beltline materials and that this configuration serves the same purpose as the 360° circumferential thermal shield, the staff finds the above response acceptable.

2.3.1.2.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant’s scoping results for the reactor vessel internals. The staff concludes that the applicant has adequately identified the reactor vessel internals components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the reactor vessel internals that are subject to an AMR, as required by 10 CFR 54.21(a)(1)

2.3.1.3 Reactor Coolant System and Connected Lines

2.3.1.3.1 Summary of Technical Information in the Application

In Section 2.3.1.3 of the LRA, the applicant described the RCS and connected lines, which consist of the RCS piping components, pressurizer, and reactor coolant pumps (RCPs).

<u>RCS Piping Components</u>

The RCS consists of three parallel heat transfer loops. Each loop contains an RCP, steam generator, and associated piping and valves. In addition, the system includes interconnecting piping and instrumentation necessary for operational control. All major components are located in the containment building. During operation, the RCS transfers the heat generated in the core to the steam generators. The RCS pressure boundary provides a barrier against the release of radioactivity generated within the reactor and is designed to ensure a high degree of integrity throughout the life of the plant.

The RCS system boundary includes all of the ASME Class 1 piping components, the pressurizer, the RCPs, and ASME Class 1 branch piping connected to the RCS loops. Based on this convention, the RCS system boundary includes the ASME Class 1 portions of the emergency core cooling system (ECCS), chemical and volume control system (CVCS), and sampling system. The system boundary also includes non-ASME Class 1 piping components directly associated with the RCS boundary. RCS piping includes special components such as the pressurizer spray scoop, sample connection scoops, and the resistance temperature detector (RTD) installation bosses and thermowells.

Pressurizer

The RCS pressure is controlled by the pressurizer, where electrical heaters and coolant sprays maintain the water and steam in equilibrium. Steam can be formed or condensed to minimize pressure variations caused by contraction or expansion of the reactor coolant. Spring-loaded safety valves and power-operated relief valves are connected to the pressurizer upper head. The pressurizer is a vertical, cylindrical vessel with hemispherical top and bottom heads. A surge line nozzle and removable electric heaters are installed in the bottom head. Spray line nozzles and relief and safety valve connections are located in the top head of the pressurizer vessel. The pressurizer bottom nozzle is connected to a reactor coolant hot leg by means of the pressurizer surge line.

Reactor Coolant Pumps

Each of the three reactor coolant loops contains a vertically mounted, single-stage, centrifugal RCP that employs a controlled leakage seal assembly. The RCPs provide the motive force for circulating the reactor coolant through the reactor core, piping, and steam generators.

In Table 2.2-1a of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the RCS and connected lines:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.1.3 of the LRA, the applicant listed the RCS and connected lines component types that are within the scope of license renewal and subject to an AMR, including closure bolting, Class 1; piping, Class 1 (reactor coolant loop); piping, Class 1 (piping components less than nominal pipe size (NPS) 4); piping, Class 1 (piping components greater than or equal to NPS 4); valve bodies, Class 1; flow orifice/element, Class 1; RCP (pump casing); RCP (main flange bolts); RCP (main closure flange); RCP (thermal barrier assembly); pressurizer (closure bolting—manway); pressurizer (heater sheaths); pressurizer (instrument nozzles and heater well nozzles); pressurizer (manway and cover); pressurizer (nozzle safe ends); pressurizer (nozzles—surge, spray, safety, relief); pressurizer (shell, upper head, and lower head); pressurizer (spray head assembly); pressurizer (support skirt and flange); pressurizer (thermal sleeves—surge and spray nozzles); pressurizer support lugs, closure bolting, non-Class 1; piping, non-Class 1; and valve bodies, non-Class 1.

The applicant stated that the RCP seals are not listed in the table and are not subject to an AMR for the following reasons:

- Seal function is active in nature. Rotating seal faces are a part of the RCP rotating assembly which is an active component.

- The RCP seal package and its constituent components are periodically overhauled. The seals are inspected and parts are replaced, as required.

- Plant and industry operating experience with RCP seal performance has demonstrated the effectiveness of these activities. Seal leakoff is closely monitored in the control room, and abnormal seal flows are alarmed as conditions requiring evaluation and corrective actions.

2.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.3, FNP FSAR Chapter 5.0, and FNP FSAR Sections 5.5.1 and 5.5.10. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR for any functions delineated under 10 CFR 54.4(a) that the applicant had not identified as intended functions in the LRA; the staff then evaluated whether that the SSCs with such functions will be adequately managed so that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff next evaluated whether the applicant had identified all passive or long-lived components that are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

In its review of LRA Section 2.3.1.1, the staff identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated February 13, 2004, the staff issued an RAI to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated March 12, 2004.

In RAI 2.3.1.3-1, the staff requested the applicant to verify whether the component groups "piping, Class 1 (reactor coolant loop)"; "piping, Class 1 (piping components < NPS 4)"; and "piping, Class 1 (piping components $ NPS 4)" listed in LRA Table 2.3.1.3 also include fittings, which serve as a pressure boundary. In accordance with 10 CFR 54.4(a), the fittings should be within the scope of license renewal. The staff requested the applicant to justify the exclusion or submit an AMR for the stated components.

In response to RAI 2.3.1.3-1, the applicant confirmed that pipe fittings are included within the component groups "piping, Class 1 (reactor coolant loop)"; "piping, Class 1 (piping components < NPS 4)"; and "piping, Class 1 (piping components $ NPS 4)." The applicant's component groups are consistent with the guidance of NEI-95-10, Revision 3. Appendix B to this industry guideline identifies typical components and commodity groupings for use in an IPA. Item 26 to this appendix covers the category reactor coolant pressure boundary components and the component or commodity group "ASME Class 1 piping." This item is understood to include pipe fittings.

Based on the applicant's response that pipe fittings are included in component groups "piping, Class 1 (reactor coolant loop)"; "piping, Class 1 (piping components < NPS 4)"; and "piping, Class 1 (piping components $ NPS 4)" and are within the scope of license renewal, the staff finds the applicant's response acceptable.

2.3.1.3.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the RCS and connected lines. The staff concludes that the applicant has adequately identified the RCS and connected line components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the RCS and connected piping components that are subject to an AMR, as required by 10 CFR 54.21(a)(1)

2.3.1.4 Steam Generators

2.3.1.4.1 Summary of Technical Information in the Application

Each FNP unit includes three steam generators, one in each reactor coolant loop. The replacement steam generators at FNP are Westinghouse Model 54F design. The Unit 1 steam generators were installed in May of 2000. The Unit 2 replacement steam generators were installed in May of 2001. All steam generators are vertical U-tube evaporators with integral moisture separating equipment. The head is divided into inlet and outlet chambers by a vertical partition plate extending from the head to the tubesheet. On the secondary side, feedwater flows directly into the annulus formed by the outer shell and tube bundle wrapper before entering the boiler section of the steam generator. A set of centrifugal moisture separators, located above the tube bundle, remove most of the entrained moisture in the steam. Steam dryers further increase the steam quality.

In Table 2.2-1a of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the steam generator:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))

In Table 2.3.1.4 of the LRA, the applicant listed the steam generator component types that are within the scope of license renewal and subject to an AMR, including channel divider plate; channel head and integral primary nozzles; closure bolting (primary); closure bolting (secondary); feedwater distribution assembly (thermal sleeve, piping, and fittings, spargers, support structure); feedwater inlet nozzle; primary inlet and outlet nozzle safe ends; primary manway covers and disc inserts; primary moisture separator and sludge collector assembly; primary nozzle dam rings; secondary moisture separator assembly; secondary-side manways, handholes, inspection, ports, and covers; stayrod assemblies; secondary shell penetrations; steam outlet flow limiter; tube bundle wrapper and support assembly; tube support plates, flow distribution baffles, and anti-vibration bars; tubesheet; U-tubes; upper head (with integral steam nozzle); and upper shells, lower shells, and transition cones.

2.3.1.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.4 and FNP FSAR Section 5.5.2. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR for any functions delineated under 10 CFR 54.4(a) that the applicant did not identify as intended functions in the LRA; the staff then evaluated whether the SSCs with such functions will be adequately managed so that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff did not identify any omissions. The staff next reviewed the LRA to verify that the applicant had identified all passive or long-lived components that are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant omitted any SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant did not identify any components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the steam generator components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the steam generator components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.4.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for steam generator components. The staff concludes that the applicant has adequately identified the steam generator components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the steam generator components that are subject to an AMR, as required by 10 CFR 54.21(a)(1)

2.3.2 Engineered Safety Features

In Section 2.3.2 of the LRA, the FNP UFSAR identified the SCs of the ESFs that are subject to an AMR for license renewal. The FNP UFSAR defined the ESF systems as the high-head safety injection system, low-head safety injection system, containment spray system, containment cooling system, and PRF system.

For the purpose of license renewal, the applicant described the containment cooling system in Section 2.3.3.11 of the LRA and the PRF system in Section 2.3.3.10 of the LRA. The applicant stated that, together, the high-head safety injection portion of the CVCS and the regenerative heat removal/low-head safety injection system comprise the ECCS discussed in NUREG-1801. For the purpose of license renewal, the applicant included the containment isolation system in the ESFs.

The following sections describe the ESF systems:

- containment spray system
- containment isolation system
- emergency core cooling system

2.3.2.1 Containment Spray System

2.3.2.1.1 Summary of Technical Information in the Application

In Section 2.3.2.1 of the LRA, the applicant described the containment spray system. The applicant stated that the function of the containment spray system is to spray water into the containment atmosphere, in the event of a loss-of-coolant accident (LOCA) or main steamline break, to ensure that containment peak pressure remains below its design value. The containment spray system operates in two phases following actuation. During the initial (injection) phase of operation, water from the refueling water storage tank (RWST) is used for containment spray. During the later (recirculation) phase of operation, water for the containment spray is recirculated from the containment emergency sump. Baskets located on the containment floor are loaded with trisodium phosphate, which dissolves into the recirculation fluid for postaccident sump pH control. The containment spray system is designed to operate over an extended period of time and under the environmental conditions existing following an RCS failure.

The staff reviewed the scoping and screening of the sump suction screens and the trisodium phosphate baskets in Section 2.4.1.4, “Containment Internal Structures,” of this SER. The mechanical piping system includes the vortex breakers in the emergency sump.

In Table 2.2-1b of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the containment spray system:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.2.1 of the LRA, the applicant listed the containment spray component types that are within the scope of license renewal and subject to an AMR, including closure bolting, eductor, encapsulation vessel, flow orifice/element, piping, pump casings, spray nozzles, valve bodies, and vortex breakers.

2.3.2.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.1 and FNP FSAR Section 6.2.2 and Appendix 6C to determine whether the applicant identified the containment spray system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff conducted its review in accordance with Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if there were any safety-related system functions that the applicant had not identified in the LRA as an intended function of the containment spray system, in accordance with the requirements of 10 CFR 54.4. The staff did not identify any omissions.

The staff also selected system functions described in the FSAR, and required by 10 CFR 54.4, to verify that the applicant had not omitted components having intended functions from the scope of the Rule. The staff also focused on those components that the applicant had not identified as being subject to an AMR to determine if any components were improperly omitted.

To verify that the applicant identified the components of the containment spray system that are within the scope of license renewal and subject to an AMR in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1), the staff compared the referenced P&I drawings to the system drawings and system descriptions in the FSAR to ensure that the referenced P&I drawings were representative of the containment spray system. The staff then reviewed the referenced P&I drawings to verify that the applicant had included those portions of the containment spray system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal, and had identified them as such in LRA Section 2.3.2.1. In addition, the staff determined that the applicant had identified all containment spray system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.2.1 did not identify areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, the staff did not issue any RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21.

2.3.2.1.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the containment spray system components. The staff concludes that the applicant has adequately identified the containment spray system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the containment spray system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.2 Containment Isolation System

2.3.2.2.1 Summary of Technical Information in the Application

In Section 2.3.2.2 of the LRA, the applicant described the containment isolation system. The containment isolation system is an ESF that allows appropriate process fluids to pass through the containment boundary during normal and accident conditions, while providing for isolation of containment barrier penetrations, as required, to preserve the integrity of the containment barrier during accident conditions. Containment barrier penetrations are isolated as required to prevent uncontrolled or unmonitored leakage of radioactive materials to the environment. The containment isolation system is not a completely independent system. Rather, the system comprises specific features included in other systems that penetrate the containment boundary.

The containment pressure monitoring intended function is also included in the containment isolation system boundary. The monitors provide essential indication of normal and postaccident containment pressure conditions and initiate safeguard actuation signals in response to abnormal containment pressure conditions. Process systems that have license renewal system intended functions, in addition to containment isolation or containment pressure monitoring, are addressed in the system screening results in the applicable portion of Section 2.37, "Auxiliary Systems," of the LRA. The process systems or subsystems with license renewal intended functions limited to containment isolation or containment pressure monitoring include the following:

- containment isolation system

- narrow range containment pressure monitoring (subsystem of the containment spray system)

- extended range containment pressure monitoring system

- containment leak rate test system

The civil/structural screening described in Section 2.4, “Containments, Structures, and Component Supports,” of this SER includes the pressure boundary (metallic) portions of electrical penetrations, pipe sleeve assembly surrounding process penetrations, and miscellaneous/spare mechanical penetrations that are not associated with a process system. The electrical/I&C screening described in Section 2.5, “Electrical and Instrumentation and Control Systems,” of this SER includes the nonmetallic and conductor portions of electrical penetrations.

In Table 2.2-1b of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the containment isolation system:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.2.2 of the LRA, the applicant listed the containment isolation system component types that are within the scope of license renewal and subject to an AMR, including capillary tubing (sealed), closure bolting, piping, and valve bodies.

2.3.2.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.2 and FNP FSAR Section 6.2.4 to determine whether the applicant identified the containment isolation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff conducted its review in accordance with Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if there were any safety-related system functions that the applicant had not identified in the LRA as an intended function of the containment isolation system, in accordance with the requirements of 10 CFR 54.4. The staff did not identify any omissions.

The staff also selected system functions described in the FSAR and required by 10 CFR 54.4 to verify that the applicant did not omit components having intended functions from the scope of the Rule. The staff also focused on those components that the applicant had not identified as being subject to an AMR to determine if any components were omitted.

To verify that the applicant identified the components of the containment isolation system that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1), the staff compared the referenced P&I drawings to the system drawings and system descriptions in the FSAR to ensure that the referenced P&I drawings were representative of the containment isolation system. The staff then reviewed the referenced P&I drawings to verify that the applicant had included those portions of the containment isolation system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and had identified them as such in LRA Section 2.3.2.2. In addition, the staff determined that the applicant had identified all containment isolation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.2.2 did not identify areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, the staff did not issue any RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21.

2.3.2.2.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the containment isolation system components. The staff concludes that the applicant has adequately identified the containment spray isolation components that are 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 components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.3 Emergency Core Cooling System

The ECCS includes the following systems:

- residual heat removal/low-head safety injection system
- high-head safety injection portion of the CVCS system
- refueling water storage tank and transfer system residual

2.3.2.3.1 Summary of Technical Information in the Application

In Section 2.3.2.3 of the LRA, the applicant identified the components of the ECCS.

<u>Residual Heat Removal/Low-Head Safety Injection</u>

The primary function of the residual heat removal (RHR) system is to remove radioactive decay heat energy from the reactor core, as well as sensible and pump heat from the RCS, during plant cooldown and refueling operations. A secondary function of the RHR system is to transfer refueling water between the RWST and the refueling canal at the beginning and end of refueling operations. This system also provides overpressurization protection for the RCS during low temperature RCS operations.

The RHR system also serves as the low head portion of the safety injection system. The safety injection system operates in two phases following a LOCA, injection and recirculation. During the injection phase, the RHR system delivers borated water to the RCS from the RWST. During the recirculation phase, the RHR system cools and returns water collected in the containment emergency sump to the RCS and the containment spray and safety injection systems to maintain reactor core and containment cooling functions. The sump suction screens are included in the civil LRA system containment internal structures. The vortex breakers in the containment emergency sumps are included as part of the mechanical piping system.

High-Head Safety Injection

The primary purpose of the high-head safety injection system is to deliver borated cooling water to the reactor core in the event of a LOCA. The high-head safety injection system is made up of dedicated components, such as the accumulators, along with portions of the CVCS. This combination of components is utilized as the high-head portion of the safety injection system. The accumulator tanks are charged using high-pressure nitrogen to provide a passive means of injection. The nitrogen supply line to the accumulators isolates automatically upon high penetration room pressure to maintain the negative pressure required for the PRF function (see Section 2.3.3.10 of this SER, “Auxiliary and Radwaste Area Ventilation System”). The high-head safety injection system operates in two phases following a LOCA, injection and recirculation. During the injection phase, the charging pumps deliver borated water to the RCS from the RWST. The passive accumulators inject borated water into the RCS when the RCS pressure drops below the accumulator pressure. During the recirculation phase, the charging pumps recirculate water to the RCS after the water has been cooled by the RHR heat exchangers.

Refueling Water Storage Tank and Transfer System

The RWST serves as a source of emergency borated cooling water for the high-head safety injection, low-head safety injection, and containment spray during the injection mode. The RWST is designed to hold enough dilute boric acid solution to fill the refueling canal before refueling operations, and to provide injection water to support the safety injection system. The RWST can also be used to fill the refueling cavity by means of the refueling water purification pump.

In Table 2.2-1b of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the ECCS:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.2.3 of the LRA, the applicant listed the ECCS component types that are within the scope of license renewal and subject to an AMR, including charging/safety injection pump miniflow orifices, closure bolting, encapsulation vessel, flow orifice/element, RHR heat exchanger (channel head), RHR heat exchanger (shell), RHR heat exchanger (tubesheet), RHR heat exchanger (tubes), oil cooler (shell), oil cooler (channel head), oil cooler (tubes), piping, high head and RHR pump casings, safety injection accumulators, RWSTs, valve bodies, and vortex breaker.

2.3.2.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.3 and FNP FSAR Sections 5.2.2.4, 5.5.7, and 6.3. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR for any functions delineated under 10 CFR 54.4(a) that the applicant had not identified as intended functions in the LRA; the staff then evaluated whether that the SSCs with such functions will be adequately managed so that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff did not identify any omissions. The staff next reviewed the LRA to verify that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant omitted any SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant omitted any components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the ECCS components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the ECCS components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.3.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant’s scoping results for the ECCS components. The staff concludes that the applicant has adequately identified the ECCS components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the ECCS components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

In Section 2.3.3 of the LRA, the applicant identified the components of the auxiliary systems that are subject to an AMR for license renewal. Sections 2.3.3 and 2.4.2.1 of the LRA describe the following auxiliary systems and structures:

- new fuel storage
- spent fuel storage
- spent fuel pool cooling and cleanup
- overhead heavy and refueling load handling
- open-cycle cooling water
- closed-cycle cooling water
- compressed air
- chemical and volume control
- control room area ventilation
- auxiliary and radwaste area ventilation
- primary containment ventilation
- yard structures ventilation
- fire protection
- diesel fuel oil

- emergency diesel generator
- demineralized water
- high-energy line break detection
- hydrogen control
- liquid waste and drains
- oil-static cable pressurization
- potable and sanitary water
- radiation monitoring
- reactor makeup water storage
- sampling

2.3.3.1 New Fuel Storage

2.3.3.1.1 Summary of Technical Information in the Application

In Section 2.4.2.1, “Auxiliary Building” of the LRA, the applicant described new fuel storage. The fuel storage facility consists of the new fuel storage area, SFP (including the structure, liner, and fuel storage racks), fuel transfer canal, cask storage area, cask wash area, and rooms containing supporting equipment. The new fuel storage area is adjacent to the SFP, but is a separate area designed for dry storage of new fuel assemblies prior to their transfer into the SFP.

In Table 2.2-1c of the LRA, the applicant identified the following criterion it used to determine the SSCs that are within the scope of license renewal for new fuel storage:

- safety-related (10 CFR 54.4(a)(1))

In Table 2.4.2.1 of the LRA, the applicant listed the auxiliary building component types, which include the new fuel storage component types, that are within the scope of license renewal and subject to an AMR, including compressible joints and seals, concrete (exterior above grade), concrete (exterior below grade), concrete (foundation), concrete (interior), concrete (roof slab), nonfire doors, fire doors, fire seals, masonry walls (all), new fuel storage racks (storage rack assembly), penetration sleeves, spent fuel storage racks (storage racks), steel components (all structural steel), and steel components (liners).

2.3.3.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.1 and FNP FSAR Section 9.1. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR for any functions delineated under 10 CFR 54.4(a) that the applicant did not identify as intended functions in the LRA; the staff then evaluated that the SSCs with such functions will be adequately managed so that the intended component functions will be maintained consistent with the CLB for the period of extended operation. The staff did not identify any omissions. The staff next reviewed the LRA to verify that the applicant had identified all passive or long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

2.3.3.1.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for new fuel storage components. The staff concludes that the applicant has adequately identified the new fuel storage components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the new fuel storage components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.2 Spent Fuel Storage

2.3.3.2.1 Summary of Technical Information in the Application

In Section 2.4.2.1 of the LRA, the applicant described spent fuel storage. The fuel storage facility consists of the new fuel storage area, SFP (including the structure, liner, and fuel storage racks), fuel transfer canal, cask storage area, cask wash area, and rooms containing supporting equipment. The SFP is designed for underwater storage of spent fuel assemblies after their removal from the reactor. The spent fuel pool bridge crane transports the fuel assemblies. The fuel transfer canal is an intermediate handling area and is connected to the refueling canal inside containment by the fuel transfer tube. The fuel transfer canal is separated from the SFP by a removable gate. The fuel transfer canal may be drained to service the fuel-handling equipment or flooded for fuel handling.

In Table 2.2-1c of the LRA, the applicant identified the following criterion it used to determine the SSCs that are within the scope of license renewal for spent fuel storage:

- safety-related (10 CFR 54.4(a)(1))

In Table 2.4.2.1 of the LRA, the applicant listed the auxiliary building component types, which include the spent fuel storage component types, that are within the scope of license renewal and subject to an AMR, including compressible joints and seals, concrete (exterior above grade), concrete (exterior below grade), concrete (foundation), concrete (interior), concrete (roof slab), nonfire doors, fire doors, fire seals, masonry walls (all), new fuel storage racks (storage rack assembly), penetration sleeves, spent fuel storage racks (storage racks), steel components (all structural steel), and steel components (liners).

2.3.3.2.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.1 and FNP FSAR Section 9.1. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the spent fuel storage system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.4.2.1 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated December 12, 2003, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated January 9, 2004.

RAI 2.3.3.2-1

Section 9.1.2.1 of the FNP FSAR describes a transport container with a pellet canister trap and a fuel rod storage canister as additional storage containers for spent fuel rods and fuel rod debris. These storage containers provide the intended functions of radiation shielding and debris protection. The staff requested that the applicant justify the exclusion of these components from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated January 9, 2004, the applicant responded that the component intended function for the pellet canister trap, transport container, and the fuel rod storage canister is to provide structural support to facilitate storage and transport. The applicant concurred that the transport containers with a pellet canister trap, as well as the fuel rod storage containers for spent fuel rods and fuel rod debris in the spent fuel storage racks, are within the scope of license renewal and subject to an AMR. Therefore, the applicant stated that these components will be added to the scope of license renewal associated with the spent fuel storage facility as part of the auxiliary building scoping results in LRA Section 2.4.2.1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-1 acceptable because the applicant concurs that the transport containers and the fuel rod storage containers are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.2-1 resolved.

RAI 2.3.3.2-2

License renewal boundary drawings D-175043L (Unit 1) and D-205043L (Unit 2) show strainers on the spent fuel pool cooling system suction and supply lines that are excluded from the scope of license renewal. Degraded or blocked strainers could impair the performance of the decay heat removal intended function. The staff requested that the applicant justify the exclusion of these components from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated January 9, 2004, the applicant responded that it had excluded the strainers from the scope of license renewal because they do not perform a license renewal intended function, as defined by 10 CFR 54.4(a).

The applicant provided the following justification for the exclusion of the strainers from the scope of license renewal:

> The strainers are provided as a prudent design provision but do not perform a safety-related function or support a regulated event. Pool cleanliness and foreign material exclusion control are maintained, so there is no source of debris. Blockage of strainers is an event-driven scenario beyond the licensing basis for the system.
>
> There is no applicable failure mechanism that can affect a safety-related function. There is no aging effect for stainless steel in a borated water environment that would result in a failure that could impact the spent fuel pool cooling safety function. In addition, the FNP water chemistry program is already credited in the LRA for managing the spent fuel pool's water chemistry.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-2 acceptable because it adequately justifies that the strainers on the spent fuel pool cooling system suction and supply lines do not perform an intended function, in accordance with the requirements of 10 CFR 54.4(a), and clarifies their exclusion from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.2-2 resolved.

2.3.3.2.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant omitted any SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant had omitted any components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the spent fuel storage system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the spent fuel storage system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.3 Spent Fuel Pool Cooling and Cleanup System

2.3.3.3.1 Summary of Technical Information in the Application

In Section 2.3.3.3 of the LRA, the applicant described the spent fuel pool cooling and cleanup system. The spent fuel cooling and cleanup system removes decay heat generated by spent fuel assemblies stored in the SFP. The system can also be used to maintain clarity and purity of the water in the SFP, the fuel transfer canal, and the RWST.

The spent fuel pool cooling and cleanup system consists of two cooling trains, a purification loop, and a surface skimmer loop. The SFP cooling portion of the system removes decay heat from the spent fuel stored in the SFP to maintain established temperature limits within the pool and to minimize evaporative losses. Heat is transferred from the spent fuel pool cooling and cleanup system through the heat exchanger to the component cooling system.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the spent fuel pool cooling and cleanup system components which are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety related function (10 CFR 54.4(a)(2))

In Table 2.3.3.3 of the LRA, the applicant listed the spent fuel pool cooling and cleanup system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, heat exchanger (channel head), heat exchanger (shell), heat exchanger (tube-sheet), heat exchanger (tubes), piping, pump casings, and valve bodies.

2.3.3.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.3 and FNP FSAR Section 9.1.3. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant had omitted any system functions as an intended function of the spent fuel pool cooling and cleanup system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.3 identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued an RAI to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI and the applicant's response, dated April 7, 2004.

RAI 2.0-2A (D-RAI 2.3.3.3-1)

License renewal boundary drawings D-175043L (Unit 1) and D-205043L (Unit 2) do not appear to show any source of makeup water to the spent fuel pit (spent fuel pool) within the scope of license renewal. Section 9.1.3.3.2 of the FNP FSAR states that the FNP SFP was designed in accordance with RG 1.13, "Spent Fuel Storage Design Basis," Revision 1, which requires a diversity of makeup water sources to the SFP. Section 9.1.3.3.2 of the FNP FSAR also credits the demineralized water system and the reactor makeup water storage (RMWS) system as being available to supply makeup water to the SFP. Section 2.3.3.23 of the LRA states, "The license renewal intended function of the Reactor Makeup Water Storage System is to provide an assured seismic Category I make-up source to...the spent fuel pool."

The staff requested that the applicant justify the exclusion of the piping and components connecting the demineralized water system and the RMWS system to the spent fuel pool from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that the reactor makeup water hose station in the spent fuel pool area provides an assured seismic Category 1 source of makeup water to the pool. This hose station and the supply is within the scope of license renewal, as described in LRA Section 2.3.3.23 and as shown on the RMWS system license renewal boundary drawings D-175036L and D-205036L.

The applicant also clarified that demineralized water provides for normal makeup to the spent fuel pool for evaporative losses and is not required for any safety-related or regulated event. Therefore, this section of piping does not perform any intended function subject to the criteria of 10 CFR 54.4(a)(1) or 10 CFR 54.4(a)(3). The applicant further stated that portions of the demineralized water supply are within the scope of license renewal, in accordance with the criteria of 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.0-2A acceptable because it adequately justifies the basis for including the reactor makeup water hose station in the spent fuel pool area within the scope of license renewal. The applicant also justified the exclusion of certain piping sections connecting the demineralized water system to the spent fuel pool from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(3). Therefore, the staff considers RAI 2.0-2A resolved.

2.3.3.3.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the spent fuel pool cooling and cleanup system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the spent fuel pool cooling and cleanup system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.4 Overhead Heavy and Refueling Load Handling System

2.3.3.4.1 Summary of Technical Information in the Application

In Section 2.3.3.4 of the LRA, the applicant described the overhead heavy and refueling load handing system. The overhead heavy and refueling load handling system includes the refueling and servicing equipment and special tools, as well as the auxiliary building and containment cranes, hoists, and elevators.

The overhead heavy and refueling load handling system includes the fuel-handling equipment required to refuel the reactor. This system provides for the handling and storage of fuel assemblies from receipt of the new fuel to the shipment of spent fuel. The major fuel-handling equipment includes the containment polar crane, reactor cavity manipulator cranes, spent fuel bridge cranes, and spent fuel cask crane. This component category also includes the special tools and adapters used for lifting and handling the vessel head, internals, fuel assembly inserts, etc. Fuel-handling devices have provisions to avoid dropping or jamming of fuel assemblies during transfer operation.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine which components of the overhead heavy and refueling load handling system are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))

In Table 2.3.3.4 of the LRA, the applicant listed the overhead heavy and refueling load handling system component types that are within the scope of license renewal and subject to an AMR, including baseplates and anchors for attachment to structures and retaining clips, cranes including bridge and trolley (structural girders), and rail system (rail).

2.3.3.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.4 and FNP FSAR Section 9.1.4. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the overhead heavy and refueling load handling system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.4 identified areas in which it needed additional information to complete the review of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 7, 2004.

<u>RAI 2.3.3.4-1</u>

In LRA Section 2.3.3.4, the applicant provided a brief description of the overhead heavy and refueling load handling system. This section of the LRA identifies the containment polar crane, the reactor cavity manipulator crane, the spent fuel pool bridge crane, the spent fuel cask crane, and the special tools and adapters used for lifting and handling refueling loads as being part of the overhead heavy and refueling load handling system. However, the LRA does not identify which of these cranes have components subject to an AMR, nor does LRA Table 2.3.3.4 identify any of the special tools and adapters used for lifting and handling refueling loads as being subject to an AMR. The staff requested that the applicant identify the specific cranes that contain components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1), and justify the exclusion of the special tools and adapters used for lifting and handling refueling loads from an AMR.

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

By letter dated April 7, 2004, the applicant responded that the containment polar crane, the reactor cavity manipulator crane, the spent fuel pool bridge crane, and the spent fuel cask crane are within the scope of license renewal and contain components subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

The applicant further stated that the special tools and adapters used for lifting and handling the reactor vessel head, internals, and fuel assembly inserts are active components within the scope of license renewal and are not subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

In response to the staff's request to identify any of the special tools and adapters within the scope of license renewal used for lifting and handling of refueling loads, the applicant stated that these include the head lifting rig, rod control cluster handling tool, thimble plug handling tool, burnable poison rod assembly tool, and spent fuel-handling tool. The applicant's scoping process determined that these devices performed their intended functions with moving parts and/or a change in configuration and therefore are not subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.4-1 acceptable because it (1) identifies the cranes or hoists that are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively, and (2) justifies that the special tools and adapters used for lifting and handling of refueling loads perform their intended functions with moving parts and/or a change in configuration and therefore are excluded from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.4-1 resolved.

RAI 2.3.3.4-2

Several structures typically contain cranes or hoists located above or near safety-related equipment (e.g., the intake structure and the diesel generator building). The staff requested that the applicant describe how it evaluated areas containing cranes or hoists near safety-related equipment to identify those cranes or hoists subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1), and explain where the LRA identifies those components in the LRA.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that cranes and hoists were evaluated by the civil discipline for the LRA, described in LRA Section 2.1.3.2. In the LRA, a "spaces approach" was used to place all civil/structural components in a structure housing safety-related SSCs within the scope of license renewal. Therefore, the applicant considered all cranes and hoists located above or near safety-related equipment within scope.

The applicant further stated that cranes associated with overhead heavy and fuel-related load handling were grouped together in LRA Section 2.3.3.4 (to align with the NUREG-1801 grouping) with the component types subject to an AMR. Table 2.3.3.4 of the LRA also identifies these groups. The applicant included all other cranes and hoists in scope as part of the overall evaluation of its structure in LRA Section 2.4. The components subject to an AMR are included in the component type "steel components—all structural steel" for the associated structure, as listed in the table for components subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.4-2 acceptable because it adequately explains how the applicant evaluated areas containing cranes and hoists near safety-related equipment. In addition, the response identifies the cranes or hoists subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.4-2 resolved.

2.3.3.4.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff did not identify any omissions. In addition, the staff performed an independent assessment to determine if the applicant had identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the overhead heavy and refueling load handing system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the overhead heavy and refueling load handing system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.5 Open-Cycle Cooling Water System

2.3.3.5.1 Summary of Technical Information in the Application

In Section 2.3.3.5 of the LRA, the applicant described the open-cycle cooling water system. The open-cycle cooling water system includes the service water system and portions of the river water system (service water pond water-level instruments). The service water system provides cooling water to plant loads during normal and emergency modes of operation. Heat loads include the component cooling water system, room coolers, containment coolers, EDGs, and certain turbine building loads. The system also provides a backup supply to the AFW system.

The service water system draws cooling water from the service water pond, which serves as the ultimate heat sink for FNP. The river water system supplies makeup water to the service water pond. The only portions of the river water system that are in the scope of the open-cycle cooling water system are the service water pond water-level instruments used for aligning the service water system into its emergency recirculation mode.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine which components of the open-cycle cooling water system are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))

In Table 2.3.3.5 of the LRA, the applicant listed the open-cycle cooling water system component types as within the scope of license renewal and subject to an AMR, including air compressor lube oil cooler (channel head); air compressor lube oil cooler(shell); air compressor lube oil cooler(tubes/tubesheet); air compressor intercooler, aftercooler, and bleed-off air cooler (shells); air compressor bleed-off air cooler (channel head); air compressor intercooler, aftercooler, and bleed-off air-cooler (tubes/tubesheet); closure bolting; component cooling water (CCW) heat exchanger (channel head); CCW heat exchanger (shell); CCW heat exchanger (tubesheet); CCW heat exchanger (tubes); containment and ESF room coolers (channel head and tubes); flow orifice/element; piping; piping with guard pipe; service water pump casings; lube and cooling water pump casings; strainers (element); strainers (shell); and valve bodies.

In its response to RAI 2.1-1 (discussed in Section 2.1.3.1 of this SER), the applicant changed the methodology it used for scoping of non-attached, non-safety-related piping for the open-cycle cooling water system, in accordance with 10 CFR 54.4(a)(2). By letter dated June 4, 2004, the applicant submitted the supplemental information associated with the determination of SSCs within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2), as a result of the revised scoping methodology (see Enclosure 2, "Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4 (a)(2)").

The applicant's change in methodology expanded the mechanical SSCs within the scope of license renewal. In its supplemental information related to 10 CFR 54.4(a)(2), the applicant listed the impact of changes in the 10 CFR 54.4(a)(2) scoping methodology on the LRA results for the in-scope components of the open-cycle cooling water system. Although this table shows an increase in the number of in-scope SSCs for the open-cycle cooling water system, the applicant stated that the component types do not differ from those listed in LRA Table 2.3.3.5.

2.3.3.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.5 and FNP FSAR Sections 9.2.1 and 9.5.5. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the open-cycle cooling water system from the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.5 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 22, 2004, and June 18, 2004.

RAI 2.3.3.5-1

(a) On license renewal boundary drawing A-200475L, the compressed air filter N2P16F560 is shown within the scope of license renewal. However, LRA Table 2.3.3.5 does not list the compressed air filter as a component type subject to an AMR. Air filters serve the intended function of pressure boundary and are passive and long-lived components.

Therefore, the staff requested that the applicant justify the exclusion of the filter housing from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

(b) On license renewal boundary drawings A-170059L and A-200475L, two components, which appear to be a roto-flow meter and a pressure regulator, have symbols that are not identified in the license renewal boundary drawings for P&ID legend and symbols. These components are shown within the scope of license renewal. The staff requested that the applicant provide additional information to identify these components and clarify whether they are included in LRA Table 2.3.3.5 as being subject to an AMR. If not, the staff requested that the applicant justify their exclusion from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

(a) By letter dated April 22, 2004, the applicant responded that the air filter is typically supplied by the valve vendor and is mounted on the valve as part of the valve operator assembly. The air filter is an integral part of the valve operator and included as part of the valve operator component for license renewal. The valve operator only performs an active function and therefore is not subject to an AMR. The applicant manages age-related degradation of the valve operator under the requirements of the Maintenance Rule.

During a telephone conference between the applicant and the staff on May 24, 2004, the staff agreed to consolidate RAI 2.3.3.5-1a, RAI 2.3.3.5-1b, RAI 2.3.4.1-1, and portions of RAI 2.2-5b for the pneumatic valve operator air tanks into a revised RAI 2.2-5b because the applicant's responses to these RAIs were related to the integral parts of valve operators. Therefore, by letter dated June 25, 2004, the staff issued the revised RAI 2.2-5b. Section 2.2.3 of this SER provides the revised RAI 2.2-5b and the applicant's response.

(b) By letter dated April 22, 2004, the applicant responded that these components are a check valve and a self-contained pressure regulator valve which are part of the active valve operator assembly. The check valve and self-contained pressure regulator valve shown is typically supplied by the valve vendor and mounted on the valve as part of the valve operator assembly. The check valve and self-contained pressure regulator valve are integral parts of the valve operator and included as part of the valve operator component for license renewal. The valve operator only performs an active function and therefore is not subject to an AMR. The applicant manages age-related degradation of the valve operator under the requirements of the Maintenance Rule.

During a telephone conference between the applicant and the staff on May 24, 2004, the staff agreed to consolidate RAI 2.3.3.5-1a, RAI 2.3.3.5-1b, RAI 2.3.4.1-1, and portions of RAI 2.2-5b for the pneumatic valve operator air tanks into a revised RAI 2.2-5b because the applicant's responses to these RAIs were related to the integral parts of valve operators. Therefore, by letter dated June 25, 2004, the staff issued the revised RAI 2.2-5b. Section 2.2.3 of this SER provides the revised RAI 2.2-5b and the applicant's response.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 (discussed in Section 2.2.3) to be acceptable, on the basis that it adequately identified all open-cycle cooling water system's non-safety-related SSCs that are added to the scope of license renewal as a result of the changed 10 CFR 54.4(a)(2) scoping methodology.

2.3.3.5.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff did not find any omissions. In addition, the staff performed an independent assessment to determine whether the applicant had identified all components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the open-cycle cooling water system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the open-cycle cooling water system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.6 Closed-Cycle Cooling Water System

2.3.3.6.1 Summary of Technical Information in the Application

In Section 2.3.3.6 of the LRA, the applicant described the closed-cycle cooling water system. The closed-cycle cooling water system includes the component cooling water system. The component cooling water system is a closed-loop system that transfers heat to the service water system from components which process radioactive fluid. The component cooling water system acts as an intermediate heat transfer system between potentially radioactive heat sources and the service water system to reduce the probability of radioactive releases to the environment resulting from a leaking component. The primary safety function of the component cooling water system is removal of heat from various safety-related components.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the closed-cycle cooling water system components which are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.6 of the LRA, the applicant listed the closed-cycle cooling water system component types as within the scope of license renewal and subject to an AMR, including closure bolting, flow orifice/element, reactor coolant drain tank (RCDT) heat exchanger (shell), RCDT heat exchanger (tubes and tubesheet), piping, pump casings, component cooling water (CCW) surge tanks, and valve bodies.

In its response to RAI 2.1-1 (discussed in Section 2.1.3.1 of this SER), the applicant changed the methodology used for scoping of non-attached, non-safety-related piping for the closed-cycle cooling water system, in accordance with 10 CFR 54.4(a)(2). By letter dated June 4, 2004, the applicant submitted the supplemental information associated with its determination of the SSCs within the scope of license renewal, in accordance with the requirements of

10 CFR 54.4(a)(2), as a result of the revised scoping methodology (see Enclosure 2, "Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4 (a)(2)").

The revised methodology expanded the number of mechanical SSCs within the scope of license renewal. In its supplemental information related to 10 CFR 54.4(a)(2), the applicant listed the impact of its changes to the 10 CFR 54.4(a)(2) scoping methodology on the LRA results for the in-scope components of the closed-cycle cooling water system. Although this table shows an increase in the in-scope SSCs for the closed-cycle cooling water system, the applicant stated that the component types do not differ from those listed in LRA Table 2.3.3.6.

2.3.3.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.6 and FNP FSAR Section 9.2.2. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the closed-cycle cooling water system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.6 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 22, 2004.

RAI 2.3.3.6-1

(a) For FNP Units 1 and 2 RCDT heat exchangers, LRA Table 2.3.3.6 lists the heat exchanger tubesheet within the scope of license renewal and subject to an AMR. However, the applicant excluded the heat exchanger channel from the scope of license renewal on license renewal boundary drawings D-175002L and D-205002L. Heat exchanger channels serve the intended function of pressure boundary and are passive and long-lived components. The staff requested that the applicant justify the exclusion of the RCDT heat exchanger channel from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

(b) For FNP Units 1 and 2 RCDT heat exchangers, Table 2.1-3 of NUREG-1800 lists heat transfer and pressure boundary as the intended functions of the heat exchanger. The staff requested that the applicant clarify why LRA Table 2.3.3.6 does not list heat transfer as an intended function for the RCDT heat exchangers.

Applicant's Response and Staff's Evaluation

(a) By letter dated April 22, 2004, the applicant responded that the channel side of the RCDT heat exchanger is in the LW&Ds system and processes reactor coolant liquid waste from the RCDT. Processing reactor coolant liquid waste from the RCDT is not in scope for 10 CFR 54.4, however those components that perform the containment isolation function are within the scope of license renewal. The shell and tubeside of the RCDT heat exchanger (including tubesheets) is in the component cooling water system and is in scope to preserve the intended function of pressure boundary for the CCW components. The applicant further explained that the components of the RCDT heat exchanger that perform the intended function of pressure boundary are the tubes (internal and external surfaces), the tubesheets, and the shell. These components are in scope and highlighted on the license renewal boundary drawings D-175042L and D-175002L (Unit 1) and D-205042L and D-205002L (Unit 2). The channel side of the RCDT heat exchanger does not come in contact with the CCW fluid pressure boundary and is not relied upon to preserve the intended function of pressure boundary for the CCW components. A failure in the LW&Ds system pressure boundary (i.e., the channel side of RCDT heat exchanger) will not have an adverse effect on the intended function of pressure boundary for the CCW system.

The applicant further noted that the shell and tube portions of the RCDT heat exchanger are in scope only because the shell side (i.e., CCW) is not automatically isolated during an emergency. The intended function of pressure boundary for the CCW components must be preserved to assure no loss of CCW inventory during an emergency, when CCW cooling of other safety-related equipment is required. Because processing reactor coolant liquid waste from the RCDT is not in scope for 10 CFR 54.4, the heat transfer is not an in-scope intended function for this heat exchanger and should not appear in LRA Table 2.3.3.6.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-1a acceptable because it adequately explains that the channel side of the RCDT heat exchanger does not come in contact with the CCW fluid pressure boundary and is not relied upon to preserve the intended function of pressure boundary for the CCW components. Thus, the applicant excluded it from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers RAI 2.3.3.6-1a resolved.

(b) By letter dated April 22, 2004, the applicant responded that processing reactor coolant liquid waste from the RCDT is not in scope for 10 CFR 54.4(a). Therefore, the heat transfer is not a license renewal intended function for this RCDT heat exchanger and should not be listed in LRA Table 2.3.3.6.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-1b acceptable because it adequately justifies that heat transfer is not an intended function for the RCDT heat exchanger, since the processing reactor coolant liquid waste from the RCDT is not in scope. Thus, LRA Table 2.3.3.6 does not list heat transfer as an intended function for the RCDT heat exchangers. Therefore, the staff considers RAI 2.3.3.6-1b resolved.

RAI 2.3.3.6-2

The applicant excluded the FNP Units 1 and 2 postaccident sample coolers depicted on license renewal boundary drawings D-175002L and D-205002L from the scope of license renewal. However, these coolers are within the scope of license renewal on the Units 1 and 2 sampling system license renewal boundary drawings D-175009L and D-205009L. Coolers, valve bodies, and pipes serve the intended function of pressure boundary and are passive and long-lived components.

(a) The staff requested that the applicant explain why it excluded the postaccident sample coolers depicted on license renewal boundary drawings D-175002L and D-205002L, from the scope of license renewal.

(b) The staff requested that the applicant explain whether the component cooling water system pipe segments and valves (e.g., globe valve NV181A) associated with these coolers should be within the scope of the license renewal and subject to an AMR. If not, the staff requested that the applicant justify the exclusion of these components from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

(a) By letter dated April 22, 2004, the applicant responded that the tube side of the postaccident sample coolers is in the sampling system and in scope for the fire protection requirements of (10 CFR 50.48) of 10 CFR 54.4(a)(3). In the event of a fire, manual sampling of certain parameters is performed to determine that an adequate cold shutdown margin has been achieved. The tube side of these coolers is in scope for pressure boundary integrity to maintain a flowpath to the sample sink. These coolers are not in scope for the intended function of heat exchange because the samples are taken when the fluid is relatively cool (approximately 200 °F).

The applicant further stated that the shell side of these coolers is in the component cooling water system and not in scope because the shell side does not come in contact with the fluid pressure boundary of the tube side of the cooler and the CCW cooling flow is not required in the event of a fire. The applicant clarified that the intended function of exchange heat, as shown in LRA Tables 2.3.3.24 and 3.3.2-24 for these coolers, is incorrect and is removed.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-2a acceptable because it adequately explains the scoping differences between the tube side and the shell side of the postaccident sample coolers depicted on the license renewal boundary drawings. Therefore, the staff considers RAI 2.3.3.6-2a resolved.

(b) By letter dated April 22, 2004, the applicant responded that the CCW pipe segments and valves associated with the postaccident sample coolers are located on the nonsafety-related miscellaneous equipment header which automatically isolates on certain signals, such as low-low level in the surge tank. Therefore, the applicant excluded them from the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-2b acceptable because it justifies the exclusion of the CCW pipe segments and valves associated with the postaccident sample coolers from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers RAI 2.3.3.6-2b resolved.

RAI 2.0-2I (D-2.3.3.6-3)

License renewal boundary drawings D-175002L and D-205002L have notations that are not explained in the standard P&ID symbol legend or license renewal boundary drawing legend. For example, barriers shown on license renewal boundary drawings D-175002L and D-205002L are not defined in the component cooling water system drawings or the legend drawings. The staff requested that the applicant define these notations and explain the significance of including these barriers on the license renewal boundary drawings.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the barriers addressed in RAI 2.0-2I (D-RAI 2.3.3.6-3) are in-scope concrete walls and are included in the civil/structural portion of the LRA. The applicant further stated that structural components are not shown on mechanical boundary drawings, and in cases in which the structural components are shown on the mechanical boundary drawings, they are not highlighted because they are excluded from the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.0-2I acceptable because it explains why the applicant did not define the notations on the standard P&ID symbol legend and the license renewal boundary drawings. The applicant also identified the barriers addressed in the RAI. Therefore, the staff considers RAI 2.0-2I resolved.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 (discussed in Section 2.2.3) to be acceptable, on the basis that it adequately identified all CCW system's non-safety-related SSCs that are added to the scope of license renewal resulting from the changed 10 CFR 54.4(a)(2) scoping methodology.

2.3.3.6.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant had identified all components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the closed-cycle cooling water system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the closed-cycle cooling water system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.7 Compressed Air System

2.3.3.7.1 Summary of Technical Information in the Application

In Section 2.3.3.7 of the LRA, the applicant described the compressed air system. The compressed air system includes the instrument air system, service air system, and portions of the river water system that provide the nitrogen backup supply to the service water pond water-level instruments.

The instrument air system supplies compressed air for pneumatic instruments and valves, as well as for the service air system. The safety-related, air-operated valves and instruments that are required to operate following design-basis events (e.g., main steam isolation valves, pressurizer power-operated relief valves), and which are normally supplied by instrument air, are provided with backup sources of either air (accumulators) or compressed nitrogen. The Appendix R safe-shutdown analysis also relies on portions of the instrument air system.

The service air system routes compressed air supplied by the instrument air system to service air outlets throughout the plant. The service air system also contains emergency air compressors to support operation of the main steam atmospheric relief valves and turbine-driven AFW pump steam admission valves when the instrument air system is not available.

The river water system supplies makeup water to the service water pond. The only portions of the river water system that are in the scope of the compressed air system are the compressed nitrogen backup supplies to the service water pond water-level instruments.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the compressed air system components which are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.7 of the LRA, the applicant listed the compressed air component types that are within the scope of license renewal and subject to an AMR, including air accumulators, air dryers, air receiver, closure bolting, filters (casing), piping, fluid traps, and valve bodies.

2.3.3.7.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.7 and FNP FSAR Sections 9.2.1 and 9.3.1. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the compressed air system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.7 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 22, 2004, and June 10, 2004.

RAI 2.3.3.7-1

License renewal boundary drawings D-170131 and D-200019 show compressed air lines, which are excluded from the scope of license renewal, continuing to provide "air to essential instruments," as referred to on drawings D-170473 and D-200020, Sheet 1. However, the applicant did not provide drawings D-170473 and D-200020, Sheet 1, for the staff to review. The staff requested that the applicant identify the essential instruments and clarify if any intended functions performed rely on the compressed air supplied from these air lines. Alternatively, the applicant could provide drawings D-170473 and D-200020, Sheet 1, to allow the staff to determine whether the instrumentation air components on the lines to the essential instruments have been appropriately excluded from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the continuation flags indicating "air to essential instruments" depict air service to components in the turbine building that are not within the scope of license renewal. The essential instruments referred to by the continuation flag (e.g., heater drain valves to the condenser, steam jet air ejector bypass valve, moisture separator reheater (MSR) drain valves to the condenser) are essential for power production, but are not required to support a safety function or a regulated event.

In response to the staff's request to identify whether intended functions are performed that rely on the compressed air supplied from these air lines, the applicant stated that the compressed air system is designed to preferentially isolate portions of the system upon decreasing system pressure to maintain air pressure to the auxiliary and containment buildings. Air-operated valves V903 and V904 isolate the subject lines providing air to essential instruments upon decreasing pressure in the compressed air system. Therefore, the applicant did not create license renewal boundary drawings for drawings D-170473 or D-200020, Sheet 1, because they do not contain any in-scope components.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-1 acceptable because it (1) identifies the essential instruments addressed in the RAI, (2) clarifies that the essential Instrument components do not perform any intended function because these components are essential for power production only, and (3) justifies the basis for excluding the supplied compressed air lines to the essential instruments from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.7-1 resolved.

RAI 2.3.3.7-2

The staff requested the applicant to clarify and explain why certain components and their associated pipe segments and valves are excluded from the scope of license renewal and from an AMR, while components in parallel trains are considered to be within the scope of license renewal and subject to an AMR, as described below:

(a) License renewal boundary drawings D-170131 (Unit 1) and D-200019 (Unit 2) depict that trains A and B of the air compressors and air receivers, as well as their associated piping to the check valve downstream of the receivers, are excluded from the scope of license renewal. However, these license renewal boundary drawings show that the train C air compressor and air receiver, and their associated piping, are within the scope of the license renewal. The staff requested that the applicant describe how the above-mentioned components for trains A and B differ from the components for train C and explain how it considered these differences in the scoping and screening process for trains A and B.

(b) The staff requested that the applicant explain why piping and valves downstream of the check valves shown on license renewal boundary drawings D-170131L and D-200019L are considered within the scope of license renewal for trains A and B, if the air compressors and receivers are not.

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

(a) By letter dated April 22, 2004, the applicant responded that the compressed air system is not required for design-basis safe shutdown or to prevent/mitigate the consequences of an accident. However, certain components of the compressed air system are in scope for 10 CFR 54.4(a)(3), and in particular, the fire protection regulated event (10 CFR 50.48).

    In response to the staff's request to explain the differences considered in the scoping and screening process for trains A, B, and C, the applicant stated that for train C, air compressors and air receivers and dryers, as well as segments of the air distribution system are relied upon for compliance with 10 CFR 50.48 and are therefore within the scope of license renewal. For both units, the A and B air compressors and air receivers, as well as their associated piping to the check valves downstream of the receivers, are not within the scope of license renewal because they are not relied upon for compliance with 10 CFR 50.48.

    Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-2a acceptable because it explains that the train C air compressor is within the scope of license renewal because of the fire protection regulated event (10 CFR 50.48), and the trains A and B air compressors are excluded from the scope of license renewal because they are not relied upon for compliance with the fire protection regulated event (10 CFR 50.48). Therefore, the staff considers RAI 2.3.3.7-2a resolved.

(b) By letter dated April 22, 2004, the applicant stated that large portions of the air distribution system downstream of these check valves are brought into the scope of license renewal because of no readily available means to isolate them from those segments relied upon for compliance with 10 CFR 50.48. The applicant further stated that all passive and long-lived compressed air system components that are in scope for compliance with 10 CFR 50.48 were included in the screening process.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-2b acceptable because it adequately clarifies that the piping and valves downstream of the check valves trains A and B are within the scope of license renewal, since there is no readily available means to isolate them from the portions that are relied upon for compliance with the fire protection regulated event (10 CFR 50.48). Therefore, the staff considers RAI 2.3.3.7-2b resolved.

RAI 2.3.3.7-3

The staff requested that the applicant clarify whether the components of the dryer and/or compressor assemblies are scoped and screened as complex assemblies. Regarding complex assemblies, Table 2.1-2 of NUREG-1800 states that "some structures and components, when combined, are considered a complex assembly.... An applicant should establish the boundaries for each assembly by identifying each structure and component that makes up the complex assembly and determining whether or not each structure and component is subject to an AMR." The staff requested that the applicant identify the boundaries of the dryer and air compressor assemblies to determine whether the subcomponents are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the air compressors are classified as fully active components and are specifically excluded from the requirements of an AMR in the text of 10 CFR 54.21(a)(1)(I). The applicant added that based on NEI 95-10, Revision 3, which is endorsed by the NRC in RG 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," states that the air compressors do not require an AMR. The boundary of the air compressors begins from the entrance of the inlet piping to the compressor and ends where the discharge piping joins the air compressors. This is consistent with the guidance in Table 2.1-2 in NUREG 1800 pertaining to complex assemblies. The staff finds the applicant's response related to the air compressor assemblies acceptable because the applicant adequately justifies the exclusion of the air compressors from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

For the air dryers, the applicant stated that the air dryer assemblies are complex assemblies. Consistent with the requirements of complex assemblies, the air dryer assemblies were broken down into individual components and were evaluated separately. The applicant further explained that the air dryer skids (N1P19F001A/B and N1P18F001 [should be N1P18F501]) shown on the license renewal boundary drawing D170131L, Sheets 3 and 4, contain passive pressure boundary components that were included in the AMR. The applicant stated that in LRA Table 3.3.2-7, the air dryer subcomponents were rolled up into a single component type, "air dryer," to allow the aging management strategy for these passive subcomponents to be effectively represented. The applicant also stated that the boundary of the air dryer component type begins where the 3" HBD-433 line enters the dryer skid and ends where the line leaves the skid.

The staff found this portion of the applicant's response unacceptable because the staff observed that the license renewal boundary drawings showed the air dryer skids to be mounted on separate skids, rather than on a single skid. Furthermore, in the tables provided by the applicant in its response to RAI 2.2-2, the air dryer component type was defined as “air dryer of the compressed air system. Only the shell of the air dryer is considered passive and long-lived.” In addition, LRA Table 3.3.2-27 did not provide any details of the air dryer subcomponents. In regard to the boundary of the air dryers, the staff found that the applicant’s response differed from the boundaries shown on the license renewal drawings.

During a telephone conference on May 24, 2004, between the applicant and the NRC staff, the applicant agreed to revise its response to RAI 2.3.3.7-3 to define the air dryer subcomponents and the boundary of air dryer assemblies. By letter dated June 10, 2004, the applicant’s revised response stated that the air dryer assemblies are complex active assemblies. The air dryer skids contain passive pressure boundary subcomponents, as shown on license renewal boundary drawings D-170131L, Sheet 3 (for air dryers N1P19F001A and F001B), and D-170131L, Sheet 4 (for N1P18F501A). The passive subcomponents are piping, valve bodies, filter casings, the air dryer casing, the purge exhaust mufflers, and the restricting orifices. The subcomponents are comprised of carbon steel. The applicant has chosen “air/gas (wetted)” as the interior environment for all of the subcomponents on the skid. The exterior environment of all the subcomponents is “inside.” In LRA Table 3.3.2-7, the applicant rolled the subcomponents up into a single component type, ”air dryer,” to allow the aging management strategy for these passive subcomponents to be effectively represented.

In response to the staff’s request to identify the boundaries of the air dryer component type, the applicant stated the following:

- On license renewal boundary drawing D-170131L, Sheet 3, the boundary of the air dryer component type begins where the 3" HBD-261 line enters the dryer skid and ends where the 3" HBD-262 line leaves the skid.

- On license renewal boundary drawing D-170131L, Sheet 4, the boundary of the air dryer component type begins where the 3" HBD-433 line enters the dryer skid and ends where the line leaves the skid.

Based on its review, the staff finds the applicant’s revised response to RAI 2.3.3.7-3 acceptable because it (1) clarifies that the applicant had scoped and screened the components of the dryer and/or compressor assemblies as complex assemblies, (2) identifies the passive subcomponents of the air dryer component type that are within the scope of license renewal, (3) identifies the boundaries of the air dryer and its subcomponents subject to an AMR and, (4) identifies the boundaries of the air compressor assemblies and justifies their exclusion from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.7-3 resolved.

RAI 2.3.3.7-4

License renewal boundary drawing D-170131L shows a Y-strainer (noted as “strainer by field”) within the scope of license renewal. Straners provide the intended function of debris protection and pressure boundary and are passive and long-lived components. The staff requested that the applicant justify the exclusion of the Y-strainer from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the strainer body performs the intended function of pressure boundary and is screened as carbon steel pipe. The strainer element is within the scope of license renewal and provides the intended function of debris protection. The applicant concluded that LRA Tables 2.3.3.7 and 3.3.2-7 inadvertently omitted the strainer element. In its response, the applicant provided tables for the addition of this component to LRA Table 2.3.3.7 and to the corresponding LRA Table 3.3.2-7.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-4 acceptable because it adequately clarifies that the strainer body and strainer element are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.7-4 resolved.

2.3.3.7.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff did not find any omissions. In addition, the staff performed an independent assessment to determine whether the applicant had identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the compressed air system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the compressed air system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.8 Chemical and Volume Control System

2.3.3.8.1 Summary of Technical Information in the Application

In Section 2.3.3.8 of the LRA, the applicant described the CVCS. For the purposes of the application, the CVCS includes the non-ECCS portions of the CVCS and the boron thermal regeneration system (BTRS).

The CVCS maintains the required inventory in the RCS by maintaining the programmed water level in the pressurizer. The CVCS also provides a continuous feed and bleed of reactor coolant water which is used in the control of water chemistry conditions, activity level, and soluble chemical neutron absorber concentration and makeup. The CVCS also provides seal water injection flow to the RCPs. Portions of the system contain borated water at higher concentration than the RCS for use in maintaining the reactor shutdown margin. The system includes provisions for recycling reactor grade water. Portions of the CVCS function as part of the ECCS to provide injection flow to the RCS during postaccident injection and recirculation.

The BTRS is occasionally used as deborating demineralizers to reduce reactor coolant boron concentration towards the end of core life. Although not typically used for this purpose at FNP, the BTRS is designed to provide load-following capabilities by varying the RCS boron concentration to compensate for xenon transients and other reactivity changes, which occur when the reactor power level is changed. The RCS boron concentration is changed by storing boron in, or releasing boron from, thermally regenerable demineralizers. The function of this system is not safety related. The BTRS is installed for economic reasons only. The CVCS performs safety-related boration and dilution. However, when in use, the BTRS forms part of the letdown path for the CVCS and is a high-energy line.

High-energy line break (HELB) compartment/room pressure sensors are provided in areas affected by a rupture of a CVCS letdown line or a BTRS line to initiate letdown line isolation. The compartment/room pressure sensors are addressed separately as part of the HELB detection system boundary.

In Table 2.2-1c of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the CVCS:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.8 of the LRA, the applicant listed the CVCS component types that are within the scope of license renewal and subject to an AMR, including closure bolting; regenerative heat exchanger (channel heads); regenerative heat exchanger (shells); regenerative heat exchanger (tubes/tubesheet); letdown, excess letdown, and RCP seal water heat exchangers (channel head); letdown, excess letdown, and RCP seal water heat exchangers (shell), letdown, excess letdown, and RCP seal water heat exchangers (tubes/tubesheet); boron thermal regeneration chiller (channel head); boron thermal regeneration chiller (tubes/tubesheet); boron thermal regeneration moderating and reheat heat exchanger (channel head and shell); boron thermal regeneration moderating and reheat heat exchangers (tubes/tubesheet); demineralizers (pressure retaining components); filters (casing); letdown orifices; piping; boric acid transfer pump casings; boric acid transfer pump casings; boric acid tanks; volume control tank; and valve bodies.

2.3.3.8.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.8 and FNP FSAR Sections 9.3.4.1 and 9.3.4.2. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR for any functions delineated under 10 CFR 54.4(a) that the applicant had not identified as intended functions in the LRA, and to verify that the SSCs with such functions will be adequately managed so that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff did not identify any omissions. The staff then reviewed the LRA to verify that the applicant had not omitted passive or long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant had omitted any components that should be subject to an

AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the CVCS components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the CVCS components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.8.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the chemical and volume control components. The staff concludes that the applicant has adequately identified the chemical and volume control components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the chemical and volume control components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.9 Control Room Area Ventilation System

2.3.3.9.1 Summary of Technical Information in the Application

In Section 2.3.3.9 of the LRA, the applicant described the control room area ventilation system. The control room area ventilation system provides ventilation, heating, cooling, filtration, and air intake and exhaust isolation during normal operation and following a design-basis accident. The system consists of two parts, an environmental control system and an air cleanup system. The environmental control system operates continually during normal and emergency conditions. The air cleanup system normally operates only during emergency conditions. The control room area ventilation system has three operational modes—normal ventilation, emergency pressurization, and emergency recirculation. The safety-related operating modes are emergency recirculation and emergency pressurization. This system maintains the control room environment within design limits and ensures compliance with the control room dose requirements of Appendix A to 10 CFR Part 50, General Design Criterion 19 (GDC), "Control Room."

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the SSCs that are within the scope of license renewal for the control room area ventilation system:

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))

In Table 2.3.3.9 of the LRA, the applicant listed the control room area ventilation system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, compressible joints and seals, cooling coils (heating, ventilation, and air conditioning (HVAC) refrigerant coils and fins), ducts and fittings, equipment frames and housings, fire dampers (frames and housings only), flexible connectors, piping, and valve bodies.

2.3.3.9.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.9 and FNP FSAR Sections 6.4 and 9.4.1 to determine whether the applicant identified the control room area ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff conducted its review in accordance with Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant had omitted any safety-related system functions as an intended function of the control room area ventilation system in LRA, in accordance with the requirements of 10 CFR 54.4. The staff did not identify any omissions.

The staff also selected system functions described in the FSAR that were required by 10 CFR 54.4 to verify that the applicant had not omitted components having intended functions from the scope of the Rule. The staff focused on components that the applicant had identified as being subject to an AMR to determine if any components were omitted.

To verify that the applicant had identified the components of the control room area ventilation system that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1), the staff compared the referenced P&I drawings to the system drawings and system descriptions in the FSAR to ensure that the referenced P&I drawings were representative of the control room area ventilation system. The staff then reviewed the referenced P&I drawings to verify that the applicant had included those portions of the control room area ventilation system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and identified them as such in LRA Section 2.3.3.9. The staff also determined that the applicant had identified all control room area ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.9 did not identify areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, the staff did not issue any RAIs to determine whether the applicant has properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21.

2.3.3.9.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the control room area ventilation components. The staff concludes that the applicant has adequately identified the control room area ventilation components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the control room area ventilation components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.10 Auxiliary and Radwaste Area Ventilation System

2.3.3.10.1 Summary of Technical Information in the Application

In Section 2.3.3.10 of the LRA, the applicant described the auxiliary and radwaste area ventilation system. For the purpose of license renewal, the auxiliary and radwaste area ventilation system includes the PRF system, engineered safeguards room air cooling system, radioactive waste ventilation and filtration system, nonradioactive ventilation system, and spent fuel pool ventilation and filtration system.

The PRF system can be aligned to operate under either of two accident modes, the post-LOCA operating mode or the fuel-handling mode. The PRF system limits releases to the environment of radioisotopes from ECCS leakage into the penetration rooms during accident (post-LOCA) conditions. The PRF system maintains a negative pressure on the room boundary to ensure leakage is into the room and filtered before being exhausted. The PRF system also provides safety-related ventilation and filtration for the SFP area. The applicant addressed the room pressure sensors assigned to the PRF system that detect elevated room pressure as part of the HELB detection system.

The engineered safeguards room air cooling system maintains the ambient temperature within analyzed limits in rooms containing designated equipment important to safety.

The radioactive waste ventilation and filtration system provides a suitable environment for personnel and for equipment operation in auxiliary building areas with the potential for radioactive contamination. The system also controls and directs potentially contaminated air to the vent stack via filtration units. The fire dampers in this system bring portions of the system within the scope of license renewal.

The nonradioactive ventilation system provides a suitable environment for personnel and for equipment operation in portions of the auxiliary building containing systems which are normally not radioactively contaminated. Battery room exhaust continuously removes combustible gases. This system is also within the scope of license renewal because of the system's fire dampers.

The spent fuel pool ventilation and filtration system provides normal ventilation and filtration for the SFP area. The system is designed to maintain a suitable environment for personnel and for equipment operation in the spent fuel areas, remove water vapors above the SFP to improve visibility, filter SFP area exhaust air during normal operation, and maintain a slightly negative pressure in the SFP area with respect to the surrounding areas and the outside. Following a fuel-handling accident, the spent fuel pool ventilation and filtration system isolates and realigns to route the exhaust air from the SFP area to the PRF system to ensure proper filtration and monitoring of the exhaust air.

The applicant has conservatively included the plant vent stack noble gas radiation monitor, which is required to comply with the guidelines of RG 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants To Assess Plant and Environs Conditions During and Following and Accident," Revision 3, (Category 2 variable), in the scope of license renewal as part of the auxiliary and radwaste area ventilation system.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the SSCs that are within the scope of license renewal for the auxiliary and radwaste ventilation system:

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.10 of the LRA, the applicant listed the auxiliary and radwaste area ventilation system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, compressible joints and seals, ducts and fittings, equipment frames and housings, cooling units (fan/coil fins only), fire dampers (frames and housings only), flexible connectors, flow orifice/element, piping, pilot tube, and valve bodies.

2.3.3.10.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.10 and FNP FSAR Sections 6.2.3, 9.4.2 and 9.4.3 to determine whether the applicant identified the auxiliary and radwaste area ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff's conducted its review in accordance with Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSARs to determine if the applicant had omitted any safety-related system functions as an intended function of the auxiliary and radwaste area ventilation system in the LRA, in accordance with the requirements of 10 CFR 54.4. The staff did not identify any omissions.

The staff also selected system functions described in the FSARs that were required by 10 CFR 54.4 to verify that the applicant had not omitted components having intended functions from the scope of the Rule. The staff focused on components that the applicant had not identified as being subject to an AMR to determine if any components were omitted.

To verify that the applicant identified the components of the auxiliary and radwaste area ventilation system that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1), the staff compared the referenced P&I drawings to the system drawings and system descriptions in the FSAR to ensure that the referenced P&I drawings were representative of the auxiliary and radwaste area ventilation system. The staff then reviewed the referenced P&I drawings to verify that the applicant had included those portions of the auxiliary and radwaste area ventilation system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and identified them as such in LRA Section 2.3.3.10. The staff also determined that the applicant had identified all auxiliary and radwaste area ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

The staff’s review of the LRA Section 2.3.3.10 did not identify areas in which it needed additional information to complete the evaluation of the applicant’s scoping and screening results. Therefore, the staff did not issue any RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21.

2.3.3.10.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant’s scoping results for the auxiliary and radwaste area ventilation system components. The staff concludes that the applicant has adequately identified the auxiliary and radwaste area ventilation system components that are 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 components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.11 Primary Containment Ventilation System

2.3.3.11.1 Summary of Technical Information in the Application

In Section 2.3.3.11 of the LRA, the applicant described the primary containment ventilation system. For the purposes of license renewal, the primary containment ventilation system includes the containment cooling system and the containment purge system.

The containment cooling system removes heat from containment during normal operation and shutdown, and functions as one of the postaccident containment heat removal systems. Each containment is equipped with four containment cooler units. Each air cooler consists of a housing equipped with a fan and finned tube coils supplied by water from the service water system. Dropout plates with release mechanisms actuated by fusible links are provided at the discharge of the containment coolers. These plates fall away to uncouple the cooler discharge from the distribution ductwork after a LOCA.

The containment purge system provides ventilation and filtration to allow access to the containment after shutdown. During normal power operation, the main purge valves are isolated and the mini-purge portion of the system provides for continuous ventilation and filtration of the containment atmosphere. Safety-related reasons for venting containment during normal power operations include controlling containment pressure and reducing airborne radioactivity.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a)criteria it used to determine the SSCs that are within the scope of license renewal for the primary containment ventilation system:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.11 of the LRA, the applicant listed the primary containment ventilation system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, compressible joints and seals, ducts and fittings, equipment frames and housings, cooling coil (fins only), fire dampers (frames and housings only), flexible connectors, flow orifice/element, piping, pitot tube, and valve bodies.

2.3.3.11.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.11 and FNP FSAR Sections 6.2.2 and 6.2.3 to determine whether the applicant identified the primary containment ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff conducted its review in accordance with Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSARs to determine if the applicant had omitted any safety-related system functions as an intended function of the primary containment ventilation system in the LRA, in accordance with the requirements of 10 CFR 54.4. The staff did not identify any omissions.

The staff also selected system functions described in the FSARs that were required by 10 CFR 54.4 to verify that the applicant had not omitted components having intended functions from the scope of the Rule. The staff focused on components that the applicant had not identified as being subject to an AMR to determine if any components were omitted.

To verify that the applicant identified the components of the primary containment ventilation system that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1), the staff compared the referenced P&I drawings to the system drawings and system descriptions in the FSARs to ensure that the referenced P&I drawings were representative of the primary containment ventilation system. The staff then reviewed the referenced P&I drawings to verify that the applicant had included those portions of the primary containment ventilation system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and identified them as such in LRA Section 2.3.3.11. The staff also determined that the applicant had identified all primary containment ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

The staff’s review of the LRA Section 2.3.3.11 did not identify areas in which it needed additional information to complete the evaluation of the applicant’s scoping and screening results. Therefore, the staff did not issue any RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21.

2.3.3.11.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant’s scoping results for the primary containment ventilation system components. The staff concludes that the applicant has adequately identified the primary containment ventilation system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the primary containment ventilation system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.12 Yard Structures Ventilation System

2.3.3.12.1 Summary of Technical Information in the Application

In Section 2.3.3.12 of the LRA, the applicant described the yard structures ventilation system. For the purposes of license renewal, the yard structure ventilation system includes the HVAC systems serving the various yard structures at the plant. The portions of the yard structures ventilation system in the scope of license renewal are at the service water intake structure (SWIS) and at the diesel generator building.

The SWIS and diesel generator building ventilation systems provide heating and ventilation to their associated structures to provide suitable environments for personnel and for equipment operation during normal, as well as emergency, conditions. The SWIS ventilation system also functions to minimize hydrogen concentration in the safety-related battery rooms.

In Table 2.2-1c of the LRA, the applicant identified the following criteria it used to determine the SSCs that are within the scope of license renewal for the yard structures ventilation system:

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.3.3.12 of the LRA, the applicant listed the yard structures ventilation system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, ducts and fittings, equipment frames and housings, and fire dampers (frames and housings only).

2.3.3.12.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.12 and FNP FSAR Sections 9.4.5 and 9.4.7 to determine whether the applicant had identified the yard structures ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff's conducted its review in accordance with Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSARs to determine if the applicant had omitted any safety-related system functions as an intended function of the yard structures ventilation system in the LRA, in accordance with the requirements of 10 CFR 54.4. The staff did not identify any omissions.

The staff also selected system functions described in the FSARs that were required by 10 CFR 54.4 to verify that the applicant had not omitted components having intended functions from the scope of the Rule. The staff focused on components the applicant had not identified as being subject to an AMR to determine if any components were omitted.

To determine that the applicant identified the components of the yard structures ventilation system that are within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1), the staff compared the referenced P&I drawings to the system drawings and system descriptions in the FSARs to ensure that the referenced P&I drawings were representative of the yard structures ventilation system. The staff then reviewed the referenced P&I drawings to verify that the applicant had included those portions of the yard structures ventilation system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and identified them as such in LRA Section 2.3.3.12. The staff also determined that the applicant had identified all yard structures ventilation system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

The staff’s review of the LRA Section 2.3.3.12 did not identify areas in which it needed additional information to complete the review of the applicant’s scoping and screening results. Therefore, the staff did not issue any RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21.

2.3.3.12.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the yard structures ventilation system components. The staff concludes that the applicant has adequately identified the yard structures ventilation system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the yard structures ventilation system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13 Fire Protection

2.3.3.13.1 Summary of Technical Information in the Application

In Section 2.3.3.13 of the LRA, the applicant described the fire protection system. The fire protection system protects plant personnel and equipment in the event of a fire to ensure safe shutdown of the plant and to minimize the risk of a release of radioactive material to the environment. Fire protection features include fire suppression, fire detection and actuation, and fire barriers. The applicant screened the fire detection and actuation portion of the system as part of the electrical and I&C system. The applicant screened the fire dampers as part of the assigned HVAC system. Other passive fire barriers are screened as part of structures.

The fire protection system includes both manual (use of hoses, portable extinguishers, fixed systems by plant personnel) and automatically actuated fire suppression features. Depending on the area protected, the suppression system employs extinguishing agents consisting of water, carbon dioxide, and/or Halon. The water suppression systems include the storage tanks, fire pumps (including the diesel-driven fire pump fuel oil and other auxiliary systems), yard mains, hose stations, and sprinkler systems. The carbon dioxide and Halon suppression systems include supply tanks or cylinders and distribution piping. Miscellaneous mechanical fire protection features, such as self-contained breathing apparatus, are also included.

Portable fire protection equipment, such as fire hoses, fire extinguishers, CO_2 bottles, and self-contained breathing apparatus air bottles, is not subject to an AMR because this equipment is considered short-lived, replaced on condition, and exempted from AMR consistent with the treatment of consumables.

In Table 2.2-1c of the LRA, the applicant identified the 10 CFR 54.4(a)(3) fire protection regulated event criterion as the scoping criterion used for the fire protection system components which are within the scope of license renewal.

In Table 2.3.3.13 of the LRA, the applicant listed the fire protection component types that are within the scope of license renewal and subject to an AMR, including closure bolting, fire hydrants, flexible connectors, flow orifice/element, fusible links and sprinkler head bulbs, hose station nozzles and hose connections, water system piping and valve bodies, gas system piping and valve bodies, fuel oil system piping and valve bodies, pump casings, sight glasses, spray shield, sprinkler heads, strainers (element), strainers (shell), tank protective fiberglass cover, water system tanks, gas system tanks, fuel oil system tanks, and thermal insulation (CO_2 tank).

2.3.3.13.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13 and FNP FSAR Section 9.5.1. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the fire protection system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had not omitted any passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.13 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 7, 2004.

<u>RAI 2.3.3.13-1</u>

(a) License renewal boundary drawing D-170384 shows low-pressure carbon dioxide systems on the 155'0" level of the Unit 1 turbine building excluded from the scope of license renewal. The system located between E-9 and G-9 on the drawing is not identified. License renewal boundary drawing D-200152 identifies low-pressure carbon dioxide systems in the Unit 2 turbine building and excludes the load centers and 4160-V switchgear from the scope of license renewal. The staff requested that the applicant identify the unlabeled system in Unit 1 and justify the exclusion of these systems in Units 1 and 2 from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a).

(b) License renewal boundary drawing D-170385 shows the Unit 1 high-pressure carbon dioxide systems in the river water switchgear excluded from the scope of license renewal. The staff requested that the applicant justify the exclusion of these systems from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a).

(c) License renewal boundary drawings D-170386 and D-205021 identify the Unit 1 Halon fire protection systems and Unit 2 Halon fire protection systems. Both drawings include the fire protection system in the communications room and exclude the systems in the computer room and control system cabinet room. The staff requested that the applicant justify the exclusion of the fire protection systems in the computer room and control system cabinet room from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a).

(d) License renewal boundary drawing D-508526L identifies the fuel oil systems for the diesel engine fire pumps. The drawing shows the license renewal boundary at the flexible supply and return line connection. The flexible fuel lines, the fuel filters, and fuel pumps are excluded from the scope of license renewal. The staff requested that the applicant justify the exclusion of these components from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a).

Applicant's Response and Staff's Evaluation

(a) In a letter dated April 7, 2004, the applicant responded that the only carbon dioxide SSCs in the turbine building within the scope of license renewal are those associated with the low-pressure bulk carbon dioxide storage and supply system that supplies carbon dioxide to both the Unit 1 and Unit 2 auxiliary building carbon dioxide systems. The auxiliary building carbon dioxide fire suppression equipment is relied upon to protect safety-related SSCs and ensure safe shutdown in the event of a fire as part of FNP's compliance with 10 CFR 50.48.

The Unit 1 turbine building low-pressure carbon dioxide SSCs on the 155N00 elevation shown on the drawing exist for commercial property protection and are excluded from the scope of license renewal because the applicant does not rely on the fire suppression capability for compliance with 10 CFR 50.48. License renewal boundary drawing D-170384L is included as a boundary drawing because a portion of the in-scope boundary from another drawing continues on this drawing up to and including the isolating device.

In response to the staff's request to identify the system on license renewal boundary drawing D-170384L, the applicant further stated that the system located between E-9 and G-9 on the license renewal boundary drawing is the carbon dioxide suppression system for the nonsafety-related 4-kV switchgear bus 1E (System 1T-14). The 4-kV switchgear buses and 600-V load center buses that are being fire protected by the carbon dioxide SSCs on the 155N00 elevation are nonsafety related and not relied upon for safe shutdown. Therefore, they are excluded from the scope of license renewal.

In response to the staff's request to justify the exclusion of the low-pressure carbon dioxide systems in the Unit 2 turbine building, the load centers, and the 4160-V switchgear from the scope of license renewal, the applicant stated that the carbon dioxide SSCs for the load center buses and 4-kV switchgear buses in the Unit 2 turbine building are not relied upon for compliance with 10 CFR 50.48. License renewal boundary drawing D-200152L is included because a portion of the in-scope boundary from another drawing continues on this drawing up to and including the isolating device.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-1a acceptable because it identifies the unlabeled system in Unit 1 and justifies the exclusion of the low-pressure carbon dioxide systems in the Unit 1 and Unit 2 turbine building, as well as the Unit 2 load centers and 4160-V switchgear, from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers RAI 2.3.3.13-1a resolved.

(b) In a letter dated April 7, 2004, the applicant responded that the river water system is located remotely from the plant's safety-related structures (over 2000 feet from the auxiliary buildings and from the pond) and houses the river water pumps and related equipment, none of which are required for safe shutdown (including in the event of a fire) or to mitigate any accident. The portions of the river water system within the scope of license renewal (i.e., the service water pondwater-level instruments) described in LRA

Section 2.3.3.5 are located at the service water pond and not at or in proximity of the river water structure. The applicant excluded the carbon dioxide systems located in the river water intake structure for suppressing a fire in the switchgear from the scope of license renewal because the equipment is not relied upon for compliance with 10 CFR 50.48.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-1b acceptable because it justifies the exclusion of the Unit 1 high-pressure carbon dioxide systems in the river water switchgear from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers RAI 2.3.3.13-1b resolved.

(c) In a letter dated April 7, 2004, the applicant responded that the Halon fire protection systems for the control system cabinet rooms for Unit 1 and Unit 2 are located in rooms 235 and 2235, respectively. The Halon fire protection systems for the computer rooms for Unit 1 and Unit 2 are located in rooms 201 and 2201, respectively. The applicant further stated that the carbon dioxide hose reels are located in rooms outside of, but near to, the computer rooms. For rooms 235 and 2235, SNC credits the hose stations, and for rooms 201 and 2201, SNC credts CO_2 hose reels. The Halon fire protection systems for the control system cabinet rooms and computer rooms for both FNP units remain in place, but are not relied upon for 10 CFR 50.48 compliance. Therefore, the applicant excluded these systems from the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-1c acceptable because it justifies the exclusion of the Halon fire protection systems in the computer room and control system cabinet room from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers RAI 2.3.3.13-1c resolved.

(d) By letter dated April 7, 2004, the applicant responded that the fuel oil systems for the diesel engine fire pumps are identified on license renewal boundary drawing D-508562L and are located on the fire pump diesel skid. The applicant considers these systems to be an integral part of the diesel engine active assembly and they should have been shown within the scope of license renewal on the license renewal boundary drawing.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-1d acceptable because it concurs that the fuel oil systems for the diesel engine fire pumps are within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers RAI 2.3.3.13-1d resolved.

RAI 2.3.3.13-2

The FNP FSAR identifies the cable fire barrier, such as Kaowool, needed to meet the requirements of Appendix R to 10 CFR 50.48. However, neither LRA Section 2.3.3.13 nor Section 2.4 reference these fire barriers. The staff requested that the applicant identify where it addressed these barriers in the LRA, and if they are within the scope of license renewal and subject to an AMR. If not, the staff requested that the applicant justify their exclusion from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that it addressed cable fire barriers, such as Kaowool and Maranite, in the scoping for fire barriers credited in the CLB. The applicant subjected these barrier materials to a commodity-based AMR and determined that they do not have aging effects requiring management. The applicant uses Kaowool as a fire barrier material in the auxiliary building and SWIS only. Maranite is utilized in the seismic Category 1 auxiliary building, diesel generator building, and SWIS.

The applicant further stated that LRA Tables 2.4.2.1, 2.4.2.2, and 2.4.2.5 inadvertently omitted fire wraps and fire stops as a component type subject to an AMR. Correspondingly, LRA Tables 3.5.2-2, 3.5.2-3 and 3.5.2-6 should have included the AMR summary.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-2 acceptable because it explains that cable fire barriers are addressed in the scoping for fire barriers credited in the CLB. Further, the applicant concurs that the cable fire wraps and fire stops are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.13-2 resolved.

RAI 2.3.3.13-3

The FNP FSAR states that in certain areas of the plant, such as the cable spreading room, structural steel members are provided with sprayed-on fire resistant materials. However, the applicant does not discuss these materials in either the scoping and screening sections or the AMR sections of the LRA. The staff requested that the applicant confirm that the fire-resistant coatings for structural steel members are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that the fire-resistant materials for structural steel protection are used in the auxiliary building (cable spreading room), as well as on the doors at the diesel generator building's entrance to the cable tunnels. They are within the scope of license renewal and subject to an AMR. The applicant further stated that LRA Table 2.4.2.1 should have identified these coatings as component types subject to an AMR. Correspondingly, LRA Table 3.5.2-2 should have included the AMR summary.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-3 acceptable because it concurs that the fire-resistant coatings for structural steel members are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.13-3 resolved.

2.3.3.13.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant omitted any SSCs that should be within the scope of license renewal.

The staff did not identify any omissions. In addition, the staff performed an independent assessment to determine whether the applicant had omitted any components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the fire protection system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the fire protection system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14 Diesel Fuel Oil System

2.3.3.14.1 Summary of Technical Information in the Application

In Section 2.3.3.14 of the LRA, the applicant described the diesel fuel oil system. The diesel fuel oil system supplies fuel oil to the EDGs, including the AAC-designated diesel (SBO). The diesel fuel oil system is a support system to the EDG system that is necessary to support continued operation of the diesel generators. The EDGs are supplied from dedicated day tanks in the diesel generator building, which in turn are replenished from larger, underground storage tanks.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the diesel fuel oil system components within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.3.3.14 of the LRA, the applicant listed the diesel fuel oil system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, piping, guard pipe, pump casings, strainers (element), strainers (shell), tanks, valve bodies, and vent screens.

2.3.3.14.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and FNP FSAR Section 9.5.4. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the diesel fuel oil system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.14 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 22, 2004.

RAI 2.3.3.14-1

License renewal boundary drawing D-170060L shows the storage tanks and day tanks within the scope of license renewal. LRA Table 2.3.3.14 lists tanks as a component type subject to an AMR. However, the details of the storage tanks shown on drawing B-170058L, Sheets 32 through 36, and the day tanks shown on drawing B-170058L, Sheets 24 through 28, are not included in the license renewal boundary drawings provided for review. The staff requested that the applicant (a) confirm that all internal and external subcomponents of the day tanks and storage tanks (e.g., manholes and manhole covers) are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively, or (b) provide the tank drawings referred to in this RAI for review.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the subcomponents of the day tanks and the storage tank, to the extent that they meet the requirements of 10 CFR 54.4(a), are within the scope of license renewal. The B-drawings referenced in this RAI are equipment instrumentation drawings and do not detail the internal and external subcomponents of the day tanks and storage tanks.

With regard to the fuel oil day tanks, the applicant stated that the components shown on drawing B-170058L, Sheets 24 through 28, are also shown on the license renewal boundary drawings provided with the LRA. Drawings D-170808L, D-170809L, and D-200213L show all of the components within the scope of license renewal, with the exception of one in-scope level switch per tank that is shown on boundary drawing D-170060L. These components are within the scope of license renewal, are passive and long-lived, and are listed in LRA Tables 2.3.3.14 and 3.3.2-14 as being subject to an AMR.

With regard to the fuel oil storage tanks, the applicant stated that Sheets 32 though 36 of drawing B-170058L show a vent line for the access compartment and a level transmitter (with associated tubing) for the storage tank that is not shown on the corresponding license renewal boundary drawing D-170060L. The vent line does not perform a safety-related function and its failure would not adversely affect a safety-related component or the performance of a safety-related function. Therefore, the applicant excluded the vent lines for the access compartments from the scope of license renewal. The level transmitter with associated tubing provides tank level and is conservatively included within the scope of license renewal. The level transmitter is an active component and is not subject to an AMR. Tables 2.3.3.14 and 3.3.2-14 of the LRA list the associated tubing in the component type "piping" as being subject to an AMR.

The applicant further stated that license renewal boundary drawing D-170060L highlights all the fuel oil storage tank components of a mechanical nature that are within the scope of license renewal. The highlighted dashed line on boundary drawing D-170060L around the storage tanks represents the "manhole shell" that is also shown on drawing B-170058L. This is also called the access compartment for the storage tanks. The manhole, manhole covers, and access compartment (including the roof of the compartment and the compartment access doors) are all within the scope of license renewal and are included in LRA Tables 2.3.3.14 and

3.3.2-14 as component types subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-1 acceptable because it adequately identifies the subcomponents of the day tanks and storage tanks that are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.14-1 resolved.

RAI 2.3.3.14-2

License renewal boundary drawings D-170808 and D-200213 show pipe guards from the fuel day tank vent lines to the diesel bay wall within the scope of license renewal. LRA Table 2.3.3.14 lists pipe guards as component types subject to an AMR. However, pipe guards on 1½-in. HBC-224 pipe lines from the valve boxes to the day tank containment bay are not within the scope of license renewal, as depicted on license renewal boundary drawing D-170060L. These pipe guards provide shelter protection for the fuel oil transfer lines and are passive and long-lived components. The staff requested that the applicant justify the exclusion of these pipe guards from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the pipe guards addressed by this RAI were installed in the original construction of FNP to protect the diesel fuel lines and are located in the rear hallway of the diesel generator building. The pipe guards do not perform any safety-related function, and their failure cannot prevent a safety-related function. These pipe guards are not required for any of the regulated events defined in 10 CFR 54.4(a)(3) and are not relied upon in the FNP licensing basis for compliance with 10 CFR 50.48. Therefore, the applicant concluded that the guard piping does not perform any intended function, in accordance with the requirements of 10 CFR 54.4(a), and is not subject to an AMR.

Based on its review, the staff finds the response to RAI 2.3.3.14-2 acceptable because it adequately explains the applicant's basis for excluding the pipe guards from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.14-2 resolved.

RAI 2.3.3.14-3

License renewal boundary drawing D-170060L shows that portions of the 3" HBD-443 line, at locations G3, G5, G8, G10, and G12, are within the scope of license renewal. However, the isolation valves (NSY52-V514, V513, V512, V511 and V510 at locations H3, H5, H8, H10 and H13, respectively) and the portions of the HBD-443 line downstream of these valves are not within the scope of license renewal. The isolation valve bodies provide pressure boundary isolation for the portions of the pipe that are within the scope of license renewal and are passive and long-lived components. The staff requested that the applicant explain why it excluded these isolation valves from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the fuel oil storage tanks shown on license renewal boundary drawing D-170060L are buried tanks with an access compartment that sits above each tank. The safety-related fuel oil transfer pumps are located inside the access compartment. The gravity fill line for the storage tanks enters the access compartment above the pumps and is seismically supported inside the compartment. The portion of the line outside the access compartment, up to the flanged connection, is robustly supported. However, because these lines are gravity fill, the isolation valves do not perform an intended function. The applicant stated that the line from the compartment up to the flange connection prevents moisture intrusion into the tank from the outside and was conservatively included within the scope of license renewal.

The applicant further stated that for the remainder of the line, including the aforementioned isolation valves, no failure mode would adversely impact the safety functions of the diesel fuel oil system or adversely impact the safety-related components. These lines are gravity fill and the isolation valves do not perform a license renewal intended function, in accordance with 10 CFR 54.4(a). Therefore, the rest of the fill line is not within the scope of license renewal.

Based on its review, the staff finds the response to RAI 2.3.3.14-3 acceptable because it adequately (1) explains the applicant's basis for excluding the isolation valves and portions of the HBD-443 line downstream of these valves from the scope of license renewal and from an AMR, and (2) identifies portions of the 3" HBD-443 line that are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.14-3 resolved.

RAI 2.3.3.14-4

License renewal boundary drawings D-170808L, D-170809L, and D-200213L show instrumentation symbols that are not identified on the standard P&ID legend. The applicant does not define instrumentations designated as NSR43MA506 and N1R43MA507 on D-170808L; NSR43MA508 and N1R43MA510 on D-170809L; and N2R43MA509 on D-200213L, in either the LRA or the FSAR. The staff requested that the applicant define these instrumentation components and clarify whether they penetrate the fuel oil supply tank pressure boundary. If so, the staff requested that the applicant explain why it excluded the instrumentation components from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the instruments addressed by this RAI are water detectors and are within the scope of license renewal for the intended function of pressure boundary, including the tubing (piping in LRA Table 2.3.3.14) to the detectors, as shown on the license renewal boundary drawings referenced above. Although the tubing (piping) is passive and requires an AMR, the detector itself is active and therefore does not require an AMR.

Based on its review, the staff finds the response to RAI 2.3.3.14-4 acceptable because the applicant identified the instruments addressed in the RAI and justified their exclusion from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.14-4 resolved.

2.3.3.14.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant omitted any SSCs that should be within the scope of license renewal. The staff did not find any omissions. In addition, the staff performed an independent assessment to determine whether the applicant omitted any components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the diesel fuel oil system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the diesel fuel oil system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.15 Emergency Diesel Generator System

2.3.3.15.1 Summary of Technical Information in the Application

In Section 2.3.3.15 of the LRA, the applicant described the emergency diesel generator system (EDG). For the purposes of license renewal, the EDG system consists of the FNP EDG system and the FNP diesel and auxiliaries system, which includes the following EDG support systems:

- EDG lube oil system
- EDG intercooler water system/air coolant system
- EDG jacket cooling system
- EDG air start system
- EDG air intake and exhaust system

The EDG system provides alternating current (ac) power to the onsite electrical distribution system to assure the capability for a safe shutdown in the event of a loss of offsite power. The EDG support systems are necessary to assure proper operation of the EDGs. The EDG support systems provide stored energy for starting the EDGs, along with cooling, lubrication, and combustion air intake and exhaust, to allow the EDGs to perform their function as described above. The FNP service water system, which is part of the FNP open-cycle cooling water system, supplies the cooling water to the EDG support systems heat exchangers.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the EDG system components which are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.3.3.15 of the LRA, the applicant listed the EDG system component types that are within the scope of license renewal and subject to an AMR, including air accumulators, closure bolting, ducts and fittings, electric heaters, equipment frames and housings, filters (casing), flow orifice/element, heat exchanger (channel head), heat exchanger (shell), heat exchanger (tubesheet, heat exchanger (tubes), piping, pump casings, strainers (elements), strainers (shell), tanks, and valve bodies.

2.3.3.15.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.15 and FNP FSAR Sections 8.3.1, 9.5.5, 9.5.6, and 9.5.7. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function in the EDG system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then determined, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.15 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued several RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 22, 2004, and June 10, 2004.

RAI 2.3.3.15-1

License renewal boundary drawings for the EDGs show that the non-safety-related air dryers/aftercoolers in the air start systems were excluded from the scope of license renewal. These air dryers/aftercoolers perform the intended function of removing moisture and cooldown air entering the reservoir, thus preventing the EDG starting air system from clogging as a result of excessive moisture. The safety-related air reservoir tank could not perform its intended function, should the air dryer/aftercooler fail. The staff requested that the applicant justify the exclusion of these components from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that, based on the additional review of the air dryer/aftercooler assemblies for the diesel generator air start subsystem with respect to the criteria of 10 CFR 54.4(a), it had determined that these components are within the scope of the license renewal, but for reasons other than those cited in this RAI.

The applicant stated that the safety-related function of the air start system is to provide air to support up to five attempts to start the diesel generator associated with each air start train. To assure this function, the applicant determined that the in-scope, safety-related boundary of the air start subsystems begins at the inlet isolation check valves for the air receivers in the subsystem, includes the receivers, and continues on the outlet side of the receivers all the way to the diesel generator engine block (the engine block is also within the scope of the license renewal).

The applicant added that, due to 10 CFR 54.4(a)(2) scoping, the boundary also includes the attached piping and associated supports on the inlet side of the receivers. The air dryer/aftercooler assembly is the anchor for the seismic analysis of the safety-related inlet piping. Therefore, the air dryer/aftercooler assemblies and the intervening piping and components up to the receiver are within the scope of the license renewal. The applicant further stated that the component function of serving as an anchor is the only reason the air dryer/aftercooler assemblies require an AMR.

The applicant concurred that the air dryer/aftercooler assemblies should have been included in LRA Table 2.3.3.7 as a component type subject to an AMR with the intended function of structural support. The applicant, in its response, provided tables for the addition of this component to LRA Table 2.3.3.7 and Table 3.3.2-15.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-1 acceptable because it adequately explains the basis for including the air dryer/aftercooler assemblies within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). The applicant also concurred that the air dryer/aftercooler assemblies should have been identified in LRA Table 2.3.3.7 as a component type subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.15-1 resolved.

RAI 2.3.3.15-2

The staff requested that the applicant clarify how it addressed sight glasses, air distributors, and vacuum manometers shown on the EDG license renewal boundary drawings in the LRA. License renewal boundary drawings D-170800L, D-170801L, D-170804L, D-170805L, D-170806L, D-170807L, D-200209L, D-200211L, and D-200212L show these components within the scope of license renewal. However, LRA Table 2.3.3.7 does not list sight glasses, air distributors, and vacuum manometers as component types subject to an AMR. These components serve the intended function of pressure boundary and are passive and long-lived. The staff requested that the applicant clarify whether it had the aforementioned components in LRA Table 2.3.3.7 as part of any component group. If not, the staff requested that the applicant justify the exclusion of these components from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that sight glasses serve the intended function of pressure boundary in the liquid-bearing subsystems associated with the diesel generator, are passive and long-lived components, and are therefore subject to an AMR. The applicant stated that it should have identified sight glasses in LRA Table 2.3.3.15 as a component type subject to an AMR, with the intended function of pressure boundary. The applicant, in its response, provided tables for the addition of this component to LRA Tables 2.3.3.15 and 3.3.2-15, accordingly.

The applicant further stated that the air distributor assemblies serve the intended function of pressure boundary, are passive and long-lived components, and are therefore subject to an AMR. The applicant models the air distributors as valve bodies, the associated tubing as piping, and the filter casings as filter casings.

With respect to vacuum manometers, the applicant stated that vacuum manometers are an active indicator and therefore are not listed in LRA Table 2.3.3.15 as a component type subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-2 acceptable because the applicant (1) concurred that sight glasses are subject to an AMR and should have been identified in LRA Table 2.3.3.15, (2) explained the basis for excluding the vacuum manometers from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1), and (3) explained that air distributor assemblies and the associated tubing and filter casings are within the scope of license renewal and listed in other component types as being subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.15-2 resolved.

RAI 2.3.3.15-3

License renewal boundary drawing D-506446L for the EDGs shows intake silencers, large and small mufflers (silencers), and expansion joints within the scope of license renewal. These components are passive and long-lived, but the applicant did not list them in LRA Table 2.3.3-15 as component types subject to an AMR. The staff requested that the applicant justify the exclusion of these components from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that it included the intake silencers and large and small mufflers (silencers) in the component type "equipment frames and housings;" the expansion joints are included in the component type "ductwork and fittings" in LRA Table 2.3.3.15. The expansion joints are constructed of stainless steel. However, the applicant omitted the rubber boot installed on the intake side of the diesel generator from the table. This flexible connector has the intended function of pressure boundary. The applicant included information on the rubber boot in its response to RAI 2.2-5a.

After reviewing the applicant's response, the staff concluded that the response differs from the information in LRA Table 3.3.2-15. In its response, the applicant stated that the equipment frames and housings component type is used to model the intake silencers and mufflers in LRA Table 2.3.3.15. However, LRA Table 3.3.2-15 lists the intake silencers under "ducts and fittings."

During a telephone conference on May 24, 2004, between the applicant and the NRC staff, the applicant agreed to revise its April 22, 2004, response to RAI 2.3.3.15-3. By letter dated June 10, 2004, the applicant, in its revised response, stated that intake silencers, mufflers, and expansion joints are included under the component type "ducts and fittings" in LRA Table 2.3.3.15.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-3 acceptable because it (1) clarifies that the intake silencers, large and small mufflers, and expansion joints are included in the component type "ductwork and fittings" in LRA Table 2.3.3.15 and are subject to an AMR, in accordance with the requirements 10 CFR 54.21(a)(1), and (2) states that flexible connectors (rubber boots) will be included in LRA Tables 2.3.3.15 and 3.3.3.15 as component types subject to an AMR. Therefore, the staff considers RAI 2.3.3.15-3 resolved.

RAI 2.3.3.15-4

The staff requested that the applicant clarify whether it scoped and screened the components of the EDGs in the LRA as complex assemblies. Regarding complex assemblies, Table 2.1-2 of NUREG-1800 states that "some structures and components, when combined, are considered a complex assembly.... An applicant should establish the boundaries for each assembly by identifying each structure and component that makes up the complex assembly and determining whether or not each structure and component is subject to an AMR." The staff requested that the applicant identify the boundaries of the EDGs to determine whether the subcomponents (turbochargers, turbocharger aftercoolers, governors, etc.) are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that SNC had considered the requirements of 10 CFR 54.21(a)(1), the guidance provided in Table 2.1-2 of NUREG-1800, and the Statements of Consideration (SOCs) for the Rule in determining the boundary between the active diesel generator and the EDG support systems. The engine block and its integral attachments are the starting point for defining the active diesel generator component. The turbochargers, exhaust manifold (though not the exhaust ducts), turbocharger aftercoolers, and governors are included as part of the active diesel generator component with their performance validated under the Maintenance Rule because of the frequent testing of the EDGs and the periodic maintenance and overhaul activities.

In response to the staff's request of whether the subcomponents addressed in the RAI are subject to an AMR, the applicant responded that passive parts of SCs that only perform an active function are not subject to an AMR according to 10 CFR 54.21(a)(1) and the SOCs for the Rule (60 FR 22472). The SOCs and the Rule cite the diesel generators as an example of a component that is fully active and can be excluded from an AMR. The applicant manages age-related degradation of the active diesel generator in accordance with the requirements of the Maintenance Rule.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-4 acceptable because it adequately identifies the boundaries of the EDG system and explains the basis for excluding the subcomponents of the EDG system from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1), the guidance provided in Table 2.1-2 of NUREG-1800, and the SOCs for the Rule. Therefore, the staff considers RAI 2.3.3.15-4 resolved.

RAI 2.3.3.15-5

FNP FSAR Section 9.5.7.2.1 states, "The built-in lubricating oil sump is driven from the engine drive gear and draws oil from the oil sump through a mesh screen intake screen." Similarly, FNP FSAR Section 9.5.7.2.2 states, "The built-in lubricating oil pump is driven by the engine through a flexible drive coupling and draws oil from the oil sump through a mesh intake screen." The mesh intake screens are not shown on the license renewal boundary drawings for the EDG system. The mesh intake screens are passive and long-lived components, but are not listed in LRA Tables 2.3.3.15 and 3.3.2-15 as component types subject to an AMR. The mesh screens provide the intended function of debris protection for the pipelines. The staff requested that the applicant identify the mesh intake screens on the license renewal boundary drawing and justify the exclusion of these components from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4 (a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the intake mesh screens are within the scope of license renewal and are shown indirectly on the license renewal boundary drawing in the suction strainer. The applicant further stated that these mesh screens are included in LRA Tables 2.3.3.15-1 and 3.3.2-15 in the component type "strainers (element)," with an intended function of debris protection in a lube oil environment.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-5 acceptable because it identifies the location of the mesh intake screens on the license renewal boundary drawing and clarifies that the mesh intake screens are within the scope of license renewal and listed in the component type "strainers (element)" as being subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.15-5 resolved.

RAI 2.3.3.15-6

(a) The first paragraph of FNP FSAR Section 9.5.7.3, which describes the internal oil system for the diesel engines 1C and 2C, states, "Oil flows through the lower header toward the blower end where a vertical header will not readily drain." The license renewal boundary drawings for the EDG system does not show the1C/2C EDG internal blower. Although a blower is an active component, the blower housing could be a passive long-lived component. However, the applicant did not list the blower housing in LRA Table 2.3.3.15 as a component type subject to an AMR. The staff requested that the applicant explain how the LRA addresses the blower housing and, if required, justify its exclusion from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

(b) The second paragraph of FNP FSAR Section 9.5.7.3 states, "The cooling oil from each lower piston is discharged through a hole in the insert.... This oil then drains either toward the blower or the control end and down to the oil pan or subbase." The license renewal boundary drawings do not show the 1C/2C EDG oil pan and it is not listed in LRA Table 2.3.3.15 as a component type subject to an AMR. The intended function of the oil pan/subbase is not specifically stated; typically, the oil collection pan's intended function is to ensure that leaking oil will not lead to a fire that could damage safety-related equipment. The staff requested that the applicant justify the exclusion of this component from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

(a) By letter dated April 22, 2004, the applicant responded that the blower referred to in FSAR Section 9.5.7.3 is a positive displacement-type blower that provides scavenging air under pressure to the cylinders for starting and light load operation. The blower is integrally attached to the engine block and only required to function during diesel generator operation. Therefore, the applicant included the blower as an integral part of the diesel generator active component.

In response to the staff's request of whether the blower housing is subject to an AMR, the applicant stated that passive parts of SCs that only perform an active function do not require an AMR, according to 10 CFR 54.21(a)(1) and the SOCs for the Rule (60 FR 22472). The SOCs, as well as the Rule cite the diesel generators as an example of a component that is fully active and can be excluded from an AMR. The diesel generator (including the blower) performs only an active function; therefore, its passive parts do not require an AMR. The applicant manages age-related degradation of the active diesel generator (including the blower housing) in accordance with the requirements of the Maintenance Rule.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-6a acceptable because it adequately explains the basis for excluding the blower housing from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a), 10 CFR 54.21(a)(1), and the SOCs for the Rule. Therefore, the staff considers RAI 2.3.3.15-6a resolved.

(b) By letter dated April 22, 2004, the applicant responded that the oil pan referred to in FSAR Section 9.5.7.3 is not a pan for collecting "leaking oil," but rather the typical oil sump provided for an engine by a pan mounted on the bottom of the block. In screening the diesel generators, the applicant treated the oil pan as an integral part of the engine components. The oil pan is integrally attached to the engine block and only required to function during the diesel generator operation. Therefore, the applicant included the oil pan as an integral part of the diesel generator active component.

In response to the staff's request as to whether the oil pan is subject to an AMR, the applicant responded that passive parts of SCs that only perform an active function are not subject to an AMR, according to 10 CFR 54.21(a)(1) and the SOCs for the Rule. The SOCs, as well as the Rule, cite the diesel generators as an example of a component that is fully active and can be excluded from an AMR. The diesel generator (including the oil pan) performs only an active function; therefore, its passive parts are not subject to an AMR. The applicant manages age-related degradation of the active diesel generator (including the oil pan) in accordance with the requirements of the Maintenance Rule.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-6b acceptable because it adequately explains the basis for excluding the oil pan from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), as well as the SOCs for the Rule. Therefore, the staff considers RAI 2.3.3.15-6b resolved.

<u>RAI 2.3.3.15-7</u>

(a) License renewal boundary drawing D-170806L for the EDG system shows that lube oil engine-driven pumps of the EDGs 1-2A and 1B, and their associated piping to the shuttle valve V810, are excluded from the scope of license renewal. However, license renewal boundary drawing D-200212L shows that the lube oil engine-driven pumps of the EDG 2B and its associated piping are within the scope of the license renewal. The staff requested that the applicant describe how the aforementioned components for the EDGs 1-2A and 1B differ from the components for EDG 2B. In addition, the staff requested that the applicant explain how these differences were considered in the scoping and screening process for EDGs 1-2A and 1B.

(b) License renewal boundary drawing D-170803L for the EDG system shows air coolers for the EDGs 1C and 2C within the scope of license renewal. Air coolers are passive and long-lived components and are not listed in LRA Table 2.3.3.15 as component types subject to an AMR. The staff requested that the applicant justify the exclusion of the air coolers from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

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

(a) By letter dated April 22, 2004, the applicant responded that the lube oil engine-driven pumps for the 1-2A and 1B EDGs, and their associated piping to the shuttle valve V810, are within the scope of license renewal and should have been highlighted on the license renewal boundary drawing D-170806L.

In response to the staff's request of how the aforementioned components for EDGs 1-2A and 1B differ from the components for EDG 2B, the applicant stated that there was an error in the highlighting on the license renewal boundary drawings. The engine-driven lube oil pump shown on license renewal boundary drawing D-170806L, Sheet 1, is QSR43P0526,which is highlighted on license renewal boundary drawing D-170801L, Sheet 1. Similarly, the same pump shown on license renewal boundary drawing D-170806L, Sheet 2, is QSR43P0505, which is highlighted on license renewal boundary drawing D-170801L, Sheet 2.

Based on its review the staff finds the applicant's response to RAI 2.3.3.15-7a acceptable because it adequately identifies the drawings that address the differences between EDGs 1-2 A and 1B and EDG 2B and clarifies that the lube oil engine-driven pumps for the 1-2A and 1B EDGs, and their associated piping to the shuttle valve V810, are within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers RAI 2.3.3.15-7a resolved.

(b) By letter dated April 22, 2004, the applicant responded that the air coolers were treated as an integral part of the engine components. The air coolers are bolted onto the engine block and are only required to function during the diesel generator operation. The engine block and its integral components are part of the active part of the engine. Therefore, the applicant included the air coolers as an integral part of the diesel generator active component.

The applicant further stated that passive parts of SCs that only perform an active function are not subject to an AMR, in accordance with 10 CFR 54.21(a)(1) and the SOCs for the Rule. The SOCs for the Rule cite the diesel generators as an example of a component that is fully active and can be excluded from an AMR. The diesel generator (including the air cooler) performs only an active function; therefore, its passive parts are not subject to an AMR. The applicant manages age-related degradation of the active diesel generator (including the air cooler) in accordance with the requirements of the

Maintenance Rule.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-7b acceptable because it adequately explains the basis for excluding the air coolers from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1) and the SOCs for the Rule. Therefore, the staff considers RAI 2.3.3.15-7b resolved.

2.3.3.15.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff did not identify any omissions. In addition, the staff performed an independent assessment to determine whether the applicant had identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the EDG system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the EDG system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.16 Demineralized Water System

2.3.3.16.1 Summary of Technical Information in the Application

In Section 2.3.3.16 of the LRA, the applicant described the demineralized water system. The demineralized water system consists of the demineralized water portion of the condensate and demineralized water system. The demineralized water system provides demineralized water for Units 1 and 2 during all phases of plant operations. This includes water for filling, flushing, and making up losses during startup, shutdown, refueling, power, and maintenance operations. Demineralized water makeup/supply is not required for performance of any safety-related function. Portions of the demineralized water system are brought into scope for containment isolation (where the demineralized water supply piping penetrates containment) and under the requirements of 10 CFR 54.4(a)(2) because of spatial interaction and attached piping.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine demineralized water system components which are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))

In Table 2.3.3.16 of the LRA, the applicant listed the demineralized makeup water system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, filters (casing), piping, and valve bodies.

In its response to RAI 2.1-1 (discussed in Section 2.1 of this SER), the applicant changed the methodology used for scoping of non-attached, non-safety-related piping for the demineralized water system, in accordance with 10 CFR 54.4(a)(2). By letter dated June 4, 2004, the applicant submitted the supplemental information associated with the determination of SSCs within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2), as a result of the revised scoping methodology (see Enclosure 2, “Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4 (a)(2)”).

The methodology change expanded the mechanical SSCs within the scope of license renewal. In its supplemental information related to 10 CFR 54.4(a)(2), the applicant listed the impact of the changes in the 10 CFR 54.4(a)(2) scoping methodology on the LRA results of the in-scope components for the demineralized water system. Although this table shows an increase in the in-scope SSCs for the demineralized water system, the applicant stated that the component types do not differ from those listed in LRA Table 2.3.3.16.

2.3.3.16.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.16 and FNP FSAR Section 9.2.3. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the demineralized water system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then determined, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff’s review of LRA Section 2.3.3.16 identified an area in which it needed additional information to complete the evaluation of the applicant’s scoping and screening results. Therefore, by letter dated April 1, 2004, the staff issued an RAI to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff’s RAI and the applicant’s response, dated April 29, 2004.

RAI 2.3.3.16-1

Tables 2.3.3.16 and 3.3.2-16 of the LRA list filter casings as component types subject to an AMR. However, the license renewal boundary drawings D-175047L and D-205047L for the demineralized water system do not show any filter casings within the scope of license renewal. The staff requested that the applicant provide drawings or descriptive information that identify the filter casings in the demineralized water system that are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant’s Response and Staff’s Evaluation

By letter dated April 29, 2004, the applicant responded that the filter casings addressed in RAI 2.3.3.16-1 are located in the auxiliary building. The filter casings are within the scope of license renewal under 10 CFR 54.4(a)(2) solely because of potential spatial interactions with safety-related components, the failure of which could prevent satisfactory accomplishment of a safety-related component intended function. The filter casings are not highlighted on the license renewal boundary drawings because, for each applicable LRA system, license renewal boundary drawing D-506447L identifies the room(s) where the potential spatial interaction occurs.

The applicant further identified the filters N1P11F001 and N1P11F003 which are shown on the license renewal boundary drawing D-175047L and located in auxiliary building rooms 186 and 342, as having a spatial interaction with safety-related SSCs in these rooms.

As part of their review of the implementation of the applicant's scoping and screening methodology, as described in the LRA Section 2.1, the NRC inspectors performed a license renewal scoping and screening inspection that was completed on May 14, 2004, and is documented in Inspection Report Nos. 50-348/2004-007 and 50-364/2004-007, dated June 22, 2004. The inspection consisted of a selected examination of procedures and representative records, as well as interviews with personnel, regarding the process of scoping and screening plant components to select component subject to an AMR. Additionally, the NRC inspectors performed a walkdown of selected areas of the plant containing SSCs that are considered to be within the scope of license renewal because they meet the 10 CFR 54.4(a)(2) requirement. For a sample of plant systems, specifically those that were identified by the NRC reviewers, the NRC inspectors performed visual inspections of accessible portions of the systems to observe any effects of component aging.

After reviewing the applicant's response, the staff concluded that sufficient information was not available to resolve its concerns expressed in RAI 2.3.3.16-1. Therefore, the NRC inspectors performed an inspection during the license renewal scoping and screening inspection, as documented in NRC Inspection Report Nos. 50-348/2004-007 and 50-364/2004-007, dated June 22, 2004, for the demineralized water system to evaluate an apparent inconsistency in the applicant's determination of the system filter components included within the scope of license renewal as compared to the filter components excluded from the scope of license renewal. As documented in the NRC Inspection Report Nos. 50-348/2004-007 and 50-364/2004-007, dated June 22, 2004, the inspectors reviewed the applicant's response, verified the filters referenced in the RAI, and determined that the applicant had included filters N1P11F001, N1P11F003, and N1P11F004 in accordance with the 10 CFR 54.4(a)(2) spatial criterion. However, filter N1P11F005 was not included in scope because it is in a line to an abandoned component and is therefore a dry line. The applicant identified components meeting the 10 CFR 54.4(a)(2) criterion by identifying them in drawing D-506447L, but not highlighting them on the boundary drawing for in-scope components. The inspectors concluded that the applicant had appropriately identified these filter components for the demineralized water system.

The staff found an inconsistency between the filters (N1P11F001 and N1P11F003) identified by the applicant in its response as being within the scope of license renewal and those filters (N1P11F001, N1P11F003, and N1P11F004) that were identified in the inspection report. Therefore, the staff requested that the applicant revise its RAI response to resolve this inconsistency.

By letter dated July 27, 2004, the applicant responded that its response to RAI 2.3.3.16-1, dated April 29, 2004, was provided prior to implementation of its revised 10 CFR 54.4(a)(2) scoping methodology. The applicant's revised methodology replaced the 20 foot spatial separation criterion with the spaces approach. In implementing the revised methodology, the applicant reevaluated the location of each of the demineralized water filters to determine if a spatial interaction with vulnerable safety-related SSCs was possible.

As a result, the applicant identified filter N1P11F001 in Room 342, in the same room as the spent fuel pool cooling pumps; filter N1P11F003 in Room 186, in the same room as the boric acid transfer pumps; and filter N1P11F004 in Room 180/186, located in the same space as vulnerable safety-related SSCs but separated from it by a wall, as within the scope of license renewal. The applicant identified filter N1P11F005, which is normally dry and not in a room with a vulnerable safety-related SSCs, as excluded from the scope of license renewal. This is consistent with the findings of the NRC inspection report. Subsequent to the initial RAI response and the inspection, the applicant determined that filter N1P11F006 in Room 185, which is in the same room as the component cooling water pumps, is also within the scope of license renewal even though the filter is very far away from the pumps. In its revised response to RAI 2.3.3.16-1, dated July 27, 2004, the applicant provided a table that illustrates the scoping of the filters that are shown on the license renewal boundary drawing D-175047L, Sheet 1. Because rooms 177/178 do not contain any safety-related SSCs, filter N1P11F008 in Room 177/178 is listed in this table as "Not In Scope."

Based on its review, the staff finds the applicant's revised response to RAI 2.3.3.16-1 acceptable. The staff finds that the applicant adequately identified the filters that are within the scope of license renewal because of spatial interaction of a non-safety-related component, the failure of which may prevent a safety-related component from performing its intended function, with safety-related equipment. Therefore, the staff considers RAI 2.3.3.16-1 resolved.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 (discussed in Section 2.2.3) to be acceptable, on the basis that it adequately identified all DW system's non-safety-related SSCs that are added to the scope of license renewal as a result of the changed 10 CFR 54.4(a)(2) scoping methodology.

2.3.3.16.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff did not identify any omissions. In addition, the staff performed an independent assessment to determine whether the applicant had identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the demineralized water system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the demineralized water system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.17 High-Energy Line Break Detection System

2.3.3.17.1 Summary of Technical Information in the Application

In Section 2.3.3.17 of the LRA, the applicant described the high-energy line break (HELB) detection system. For the purposes of license renewal, the HELB detection system includes compartment/room pressure and level sensors assigned to the following systems:

- boron thermal regeneration system
- liquid waste disposal system
- steam generator blowdown system
- auxiliary steam system
- condensate and feedwater system
- penetration room filtration system

The HELB detection system monitors compartment/room pressures or levels to detect HELBs. The sensors alarm in the control room to alert plant operators and, in most cases, automatically isolate the associated high-energy line(s).

Room pressure sensors monitor areas affected by a CVCS letdown line or boron thermal regeneration system (BTRS) high-energy line rupture and automatically isolate the CVCS letdown line if an HELB is detected. These sensors are assigned to the BTRS and liquid waste disposal system. Room pressure sensors assigned to the steam generator blowdown (SGBD) system monitor areas affected by an SGBD line rupture and automatically isolate the SGBD line if an HELB is detected. Room pressure sensors assigned to the auxiliary steam system monitor areas affected by a rupture of an auxiliary steam supply line to the turbine-driven AFW pump and alarm in the control room (no isolation feature) if an HELB is detected. Pressure sensors assigned to the penetration room filtration (PRF) system monitor the penetration room to detect elevated room pressure and alarm in the control room.

Level sensors assigned to the condensate and feedwater system are provided in the main steam valve room to detect flooding indicative of a line rupture. The level sensors trip the main feedwater pumps if the setpoint is exceeded. Tripping of the main feedwater pumps causes the feedwater isolation valves to close.

The HELB detection system only includes the compartment/room pressure and level sensors. The components utilized to isolate specific lines are addressed as part of the associated system.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the HELB detection system components which are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.17 of the LRA, the applicant listed the HELB detection system component types that are within the scope of license renewal and subject to an AMR, including piping and valve bodies.

2.3.3.17.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.17 and FNP FSAR Appendix 3K. The staff conducted its review using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff, using the scoping process described in Section 2.3 of this SER, reviewed the FSAR to determine if the applicant had omitted any system functions as an intended function of the HELB system in the LRA, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then determined, in accordance with the screening process described in Section 2.3 of this SER, that the applicant had identified all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.17 identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued an RAI to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI and the applicant's response, dated April 22, 2004.

<u>RAI 2.3.3.17-1</u>

The applicant lists piping and valve bodies as component types subject to an AMR in LRA Table 2.3.3.17. However, the license renewal boundary drawings which show the HELB detection instruments do not show the piping or valves associated with these instruments. Appendix 3K to the FNP FSAR does not describe the piping and valves associated with the HELB pressure and level sensors. The staff requested that the applicant provide descriptive information or drawings to allow the staff to confirm that the components in the HELB system are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

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

By letter dated April 22, 2004, the applicant responded that the HELB detection instruments are pressure switches that are installed with an isolation valve and piping/tubing routed to the room being sensed. The piping/tubing is 3/8" A-123 Gr. 304 stainless steel, and the fittings are forged stainless steel compression fittings per ASTM A-182, Gr. 316. The valves are 3/8" globe-type instrument valves with forged stainless steel bodies of ASTM A-479, Gr. 316. The internal and external surface of these components are exposed to the inside environment of the auxiliary building.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17-1 acceptable because it identifies the piping and valve bodies associated with the HELB detection instruments and clarifies that the HELB system components are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.17-1 resolved.

2.3.3.17.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff did not find any omissions. In addition, the staff performed an independent assessment to determine whether the applicant had identified all components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the HELB detection system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the HELB detection system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.18 Hydrogen Control System

2.3.3.18.1 Summary of Technical Information in the Application

In Section 2.3.3.18 of the LRA, the applicant described the components of the hydrogen control system, which includes the following FNP systems:

- containment hydrogen recombiner system
- containment post-LOCA air mixing system
- reactor cavity hydrogen dilution system
- postaccident containment venting and sampling system

The containment hydrogen recombiner system consists of redundant electrical recombiners, which are located inside the containment, for controlling hydrogen concentrations in the containment atmosphere following a design-basis accident. The recombiners' controls are located outside the containment. The recombiner units are situated in the containment such that they process a flow of containment air containing hydrogen at a concentration that is typical of the average concentration throughout the containment during accident conditions.

The containment post-LOCA air mixing system consists of four fans in two redundant trains that provide mixing of the containment atmosphere to prevent localized accumulation of hydrogen gas to concentrations greater than the lower flammability limit.

The reactor cavity hydrogen dilution system consists of two redundant fans that provide mixing of the containment atmosphere within the reactor cavity to prevent localized accumulation of hydrogen gas to concentrations greater than the lower flammability limit.

The postaccident containment venting and sampling system provides the ability to vent the containment atmosphere as a backup to the hydrogen recombiner system. The sampling portion of this system provides for monitoring of the containment atmosphere. Since the venting of the containment atmosphere is used only as a backup to the hydrogen recombiner system, it is not required to mitigate the consequences of an accident. However, if it is used, the filtration function supports maintaining offsite exposure comparable to the guidelines of 10 CFR 100.11 and, therefore, is included in the scope of license renewal.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the hydrogen control system SSCs that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.18 of the LRA, the applicant listed the hydrogen control system component types that are within the scope of license renewal and subject to an AMR, including the closure bolting, equipment frames and housings, filters (casing), flow orifice/element (annubar), hydrogen recombiner, piping, sample analyzers (pressure-retaining components), and valve bodies.

2.3.3.18.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.18 and FNP FSAR Section 6.2.5 to determine whether the applicant identified the hydrogen control system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1). The staff conducted its review in accordance with Section 2.3 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified in the LRA all safety-related system functions as an intended function of the hydrogen control system, in accordance with the requirements of 10 CFR 54.4. The staff did not identify any omissions.

The staff also selected system functions described in the FSAR and required by 10 CFR 54.4 to verify that the applicant had not omitted components having intended functions from the scope of the Rule. The staff also focused on those components that the applicant had not identified as subject to an AMR to determine if any components were improperly omitted.

To verify that the applicant identified the components of the hydrogen control system that are within the scope of license renewal and subject to an AMR in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1), the staff compared the referenced boundary drawings to the system drawings and system descriptions in the FSAR to ensure that the referenced boundary drawings were representative of the hydrogen control system. The staff then reviewed the referenced boundary drawings to verify that the applicant had included those portions of the hydrogen control system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal, and that it had identified them as such in LRA Section 2.3.3.18; and the applicant identified all hydrogen control system components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.18 did not identify areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, the staff did not issue any RAIs to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4 and the screening criteria of 10 CFR 54.21.

2.3.3.18.3 Conclusion

During its review of the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for hydrogen control system components. The staff concludes that the applicant has adequately identified the hydrogen control system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the hydrogen control system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.19 Liquid Waste and Drains

2.3.3.19.1 Summary of Technical Information in the Application

In Section 2.3.3.19 of the LRA, the applicant described the liquid waste and drains (LW&Ds).

The LW&Ds system collects, segregates, and processes reactor-grade and nonreactor-grade liquid wastes produced during plant operation, refueling, and maintenance activities. This system also includes the equipment and floor drainage system. Reactor-grade liquid waste may be recycled for plant use or processed for disposal. Nonreactor-grade liquid wastes are processed for disposal. The system is designed to control and minimize releases of radioactivity to the environment. Measurements of the rates at which various liquid waste streams accumulate and the frequency of sump pump operation are used as indicators of possible system leakage.

The containment cooler condensate level monitoring subsystem is part of the LW&Ds system and is conservatively included in the scope of license renewal. This subsystem is credited as a means to detect reactor coolant pressure boundary leakage in the CLB, including as part of the leak before break (LBB) analyses. The containment cooler condensate level monitoring subsystem collects the liquid runoff from the drain pans under each containment cooler fan unit and will alarm in response to increased condensate flow indicating a potential leak in containment.

The portion of the LW&Ds related to the RCP oil collection system is within the scope of license renewal for FP. This system is designed to collect and contain oil leakage from the RCPs to minimize the possibility of oil leakage as a fire hazard within the containment building.

For the purposes of license renewal, the portions of the LW&Ds system that penetrate the containment boundary are brought into scope for containment isolation. Portions of the system are also brought into scope to meet the requirements of 10 CFR 54.4(a)(2) due to spatial interaction and attached piping considerations and for isolation of drainpaths to support penetration room filtration (PRF) system pressure boundary requirements.

The compartment/room pressure sensors assigned to the LW&Ds system that isolate the CVCS letdown line in the event of a CVCS letdown line rupture are addressed separately as part of the HELB detection LRA system boundary.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria used to determine the LW&Ds system components that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.19 of the LRA, the applicant listed the LW&Ds system component types that are within the scope of license renewal and subject to an AMR, including flexible connectors, piping, tanks, valve bodies, closure bolting, and floor drain plugs.

In its response to RAI 2.1-1 (discussed in Section 2.1 of this SER), the applicant changed the methodology used for scoping unattached, non-safety-related piping for the LW&Ds system in accordance with 10 CFR 54.4(a)(2). By letter dated June 4, 2004, the applicant submitted the supplemental information associated with the determination of SSCs within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2) as a result of the changed scoping methodology (see Enclosure 2, “Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4(a)(2)").

The methodology change resulted in an expansion of the mechanical SSCs within the scope of license renewal. In its supplemental information related to 10 CFR 54.4(a)(2), the applicant listed the impact of changes in the 10 CFR 54.4(a)(2) scoping methodology on the LRA results of the in-scope components for the LW&Ds system. Floor drains, drain holdup tanks, and sump pumps that are relied upon in the revised methodology were brought within the scope of license renewal. The applicant also added the roof drains and sanitary drains systems to the scope of license renewal and incorporated them into the LW&Ds system. Only those roof drains that are routed over safety-related SSCs and can adversely impact the performance of any safety-related SSC were brought into scope because of 10 CFR 54.4(a)(2).

The applicant stated that because of the change in scoping methodology, the leakage detection functions of the waste holdup tank (WHT) and the floor drain tank (FDT) are considered within the scope of 10 CFR 54.4(a)(2) and evaluated for aging effects that require management. Although LRA Table 2.3.3.19 lists the component type "tank," the LW&Ds system AMR summary does not include stainless steel tanks. As a result, these stainless steel tanks should be added to LRA Table 3.3.2-19.

The applicant further stated that the floor drains include a cast iron drain body that is embedded in the concrete floor. Where the drainlines are embedded in the concrete, the material is either stainless steel or cast iron. Where the drains pass through the space of a room, the piping is either stainless steel or carbon steel, depending upon the area being drained. Table 2.3.3.19 of the LRA includes the component type "piping." Table 3.3.2-19 of the LRA already includes the aging management information for carbon steel components of this type. Cast iron components in accessible environments are not subject to general corrosion unless they are installed in a location that is subject to repeated wet-dry cycling. Cast iron that is not subject to wet-dry cycling develops an adherent oxide layer that limits the effects of general corrosion. For this reason, the floor drain cast iron components do not have an aging effect that requires management. The stainless steel embedded components also do not have an aging effect that requires management in these environments.

The applicant stated that the sump pump casings are stainless steel. The "pump casing" component type should be added to LRA Table 2.3.3.19. The stainless steel sump pump casing and the discharge piping should be added to LRA Table 3.3.2-19.

The applicant stated that the sink and floor drains from the nuclear laundry and the radiochemistry laboratories are frequently used and are routed in such a way as to pass through spaces that contain safety-related SSCs. The drains are constructed of stainless steel material and are most often empty. The water chemistry of the samples that are disposed of in these drains is at least designated as treated water and often as primary water in purity. As a result, aggressive chemical species are not likely to build up in the drains through wet-dry cycling. Therefore, SNC does not expect the drains to experience adverse aging effects during the period of extended operation. Since the postulated failure modes for this piping are hypothetical, not evaluated in the FNP CLB, and not experienced at either FNP or in the industry, this piping is not in the scope of renewal for 10 CFR 54.4(a)(2). This same argument applies to the other, infrequently used (normally empty) stainless steel floor drains, the effluent of which is processed through the WHT and the FDT.

On the nonradiologically controlled side of the auxiliary building, portions of the drains are constructed of carbon steel material. Portions of these carbon steel drains are used to remove the condensation from ventilation units, and these drains may frequently contain untreated water. Since these drains pass over safety-related SSCs that would be vulnerable to leakage, the applicant considered the drains to be within the scope of 10 CFR54.4(a)(2).

The applicant stated that the sanitary drains are normally empty but are often used. They are normally at atmospheric conditions. The drains are routed in the same areas as safety-related SSCs, and some are routed over safety-related SSCs. Therefore, leakage from these drains can cause an adverse impact upon the performance of safety-related SSCs. The sanitary drains are therefore in the scope of 10 CFR 54.4(a)(2).

The applicant stated that some of the roof drains are routed in such a way that they pass directly over SR SSCs. A through-wall failure of these drains could lead to leakage upon safety-related SSCs. Therefore, these drains are within scope. The LW&Ds system would process any leakage, however unlikely, from the roof drains so that such leakage would not cause a flood. Therefore, only those roof drains that are routed over safety-related SSCs can adversely impact the performance of any safety-related SSCs, and only those drains are in the scope of 10 CFR 54.4(a)(2). Roof drain components include the drain bodies, piping, and closure bolting.

As a result of the reliance on these components and the inclusion of the sanitary drains and the roof drains in the LW&Ds system, the applicant added "drain bodies" and "pump casings" as component types subject to an AMR in LRA Table 2.3.3.19. Accordingly, stainless steel tanks, piping and components, pump casing, and cast iron drain bodies should be added to the LW&Ds aging management summary Table 3.3.2-19.

2.3.3.19.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.19 and FNP FSAR Sections 9.3.3, 11.2 and 5.2.7. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant had identified all system functions in the LRA as an intended function of the LW&Ds system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant had not omitted passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.19 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued RAI 2.0-2B, RAI 2.0-2C, RAI 2.0-2D, and RAI 2.0-2E and, by letter dated April 1, 2004, the staff issued RAI 2.3.3.19-4 to determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 7, 2004, and April 29, 2004.

RAI 2.0-2B (D-RAI 2.3.3.19-1)

In the LRA, the applicant stated that it evaluated running traps and floor drain plugs for aging effects. Table 2.3.3.19 of the LRA lists floor drain plugs as component types subject to an AMR. However, LRA Table 2.3.3.19 does not list running traps as component types subject to an AMR. The staff requested that the applicant justify the exclusion of running traps from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that running traps, included in the component type "piping" in LRA Table 2.3.3.19, are simply a U-shaped arrangement of pipe and fittings designed to provide a water seal.

Based on its review, the staff finds the applicant's response to RAI 2.0-2B acceptable because it clarifies that running traps are included in the component type "piping" as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.0-2B resolved.

RAI 2.0-2C (D-RAI 2.3.3.19-2)

(a) In the LRA, the applicant stated that the containment cooler condensate level monitoring subsystem is conservatively included within the scope of license renewal and credited in the FNP CLB as a means to detect reactor coolant pressure boundary leakage as part of the LBB analyses. The FNP FSAR states that the condensate measuring system permits measurements of liquid runoff from the drain pans under each containment cooler fan unit and consists of a vertical standpipe, valves, and standpipe level instrumentation installed in the drain piping of the reactor containment fan cooler unit. The staff could not find these vertical standpipes on the license renewal boundary drawings. Therefore, the staff requested that the applicant confirm that these standpipes are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

(b) License renewal boundary drawing D-205004L (Unit 2) shows two atmospheric vents at locations E11 and F8. The vent shown at location F8 is within the scope of license renewal. However, the vent shown at location E11 is excluded from the scope of license renewal. The staff requested that the applicant clarify the intended function of these vents and justify the exclusion of the latter vent from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a).

(c) License renewal boundary drawings D-175004L (Unit 1) and D-205004L (Unit 2) show containment cooler condensate drains within the scope of license renewal. However, LRA Table 2.3.3.19 does not list these drains as component types subject to an AMR. The staff requested that the applicant justify the exclusion of the containment cooler condensate drains from an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). In addition, the staff requested that the applicant clarify if it supplied containment cooler condensate drains with traps or screens to prevent blockage in the standpipe.

(d) License renewal boundary drawing D-175004L shows a 3-in. atmospheric vent within the scope of license renewal. License renewal boundary drawings D-175005L and D-205005L show two 2-in. atmospheric vents within the scope of license renewal. Vents are passive, long-lived components and are not listed in LRA Table 2.3.3.19 as a component type subject to an AMR. The staff requested that the applicant justify the exclusion of this component from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

(a) By letter dated April 7, 2004, the applicant responded that the standpipes are vertically oriented piping and are part of the piping within the scope of license renewal upstream of the level transmitters depicted on license renewal boundary drawings D-175004L (Unit 1) and D-205004L (Unit 2). The applicant further stated that LRA Table 3.3.2-19 includes the standpipes in the component type "piping" as subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.0-2Ca acceptable, because it identifies the location of the standpipes on the license renewal boundary drawings and clarifies that the standpipes are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers the concerns described in RAI 2.0-2Ca resolved.

(b) By letter dated April 7, 2004, the applicant responded that the atmospheric vent for the containment cooler condensate level monitoring subsystem on license renewal boundary drawing D-205004L, at location E11, is within the scope of license renewal and should have been highlighted, similar to the vent shown at location F8. Table 2.3.3.19 of the LRA includes the vent piping in the component type "piping," with the intended function of pressure boundary, and is subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.0-2Cb acceptable, because the applicant concurred that the vent at location E11 is within the scope of license renewal and clarified that LRA Table 2.3.3-19 includes the vent in the component type "piping" as subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.0-2Cb resolved.

(c) By letter dated April 7, 2004, the applicant responded that the drains for the containment cooler drain pans comprise piping components (piping, fittings, etc.) and are subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). The applicant further stated that LRA Table 3.3.2-19 includes drains in the component type "piping" as subject to an AMR. No screens or traps are provided to prevent blockage in the standpipe.

Based on its review, the staff finds the applicant's response to RAI 2.0-2Cc acceptable because it clarifies that LRA Table 2.3.3-19 includes the containment cooler condensate drains in the component type "piping" as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.0-2Cc resolved.

(d) By letter dated April 7, 2004, the applicant responded that the atmospheric vents are passive, long-lived components that comprise piping that is open to the atmosphere. The applicant further stated that vents are in the scope of license renewal and are included in the component type “piping” in LRA Table 2.3.3.19 as subject to an AMR.

Based on its review, the staff finds the applicant’s response to RAI 2.0-2Cd acceptable because it clarifies that LRA Table 2.3.3-19 includes the atmospheric vents in the component type “piping” as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.0-2Cd resolved.

RAI 2.0-2D (D-RAI 2.3.3.19-3)

License renewal boundary drawings D-175005L (Unit 1) and D-205005L (Unit 2) show the RCP oil drip pan within the scope of license renewal. However, LRA Table 2.3.3.19 does not list the reactor coolant oil drip pan as a component type subject to an AMR. The staff requested that the applicant justify the exclusion of this component from an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant’s Response and Staff’s Evaluation

By letter dated April 7, 2004, the applicant responded that the RCP oil drip pans are subject to an AMR and are included in the component type “tanks” in LRA Table 2.3.3.19 as subject to an AMR.

Based on its review, the staff finds the applicant’s response to RAI 2.0-2D acceptable because it clarifies that LRA Table 2.3.3-19 includes the RCP oil drip pan in the component type “tanks” as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.0-2D resolved.

RAI 2.3.3.19-4

The LRA does not list prevention of internal flooding as an intended function of the waste disposal system. The staff requested that the applicant verify that the FNP internal flooding analysis does not credit any of the floor drains, equipment drains, or waste disposal system components.

Applicant’s Response and Staff’s Evaluation

By letter dated April 29, 2004, the applicant responded that the features of the LW&Ds systems credited in the FNP’s CLB, as described in FSAR Appendix 3K and Section 9.3.3, for the prevention of internal flooding include sensors, which provide line break detection and sump usage indication, and level alarms for the sumps in the lower elevations of the auxiliary building. Section 9.3.3.3 of the FSAR provides the basis for the specific features relied upon in the CLB to monitor sump usage and provide sump high level alarms.

In its response, the applicant stated that in addition to the structural features of the rooms (which include the sumps), the CLB credits the frequency of sump pump operation, the number of sump pumps operating, and the sump high level alarms for providing the operator with indication of the leak. The scope of license renewal includes the sump pump controls and sump level instrumentation under the plantwide electrical commodities. The level switches and mechanical alternators are active components and therefore do not require an AMR. The sumps themselves and other physical features such as curbing, platforms, equipment pedestals, walls, and watertight doors are included within the scope of the license renewal under the spaces approach used for civil/structural commodities in LRA Section 2.5.

The applicant also clarified that it included the in-scope line break detection sensors assigned to the LW&Ds system as part of the HELB detection system in LRA Section 2.3.3.17. These line break detection sensors are compartment/room pressure sensors that isolate the CVCS letdown line in the event of a CVCS letdown line rupture.

During review of the internal flooding prevention/mitigation scoping results for the LW&Ds system in response to this RAI, the applicant identified an omission in the LRA. Two rooms evaluated for flooding in the CLB analysis utilize drain piping to connect to a sump in an adjoining area that is relied upon to detect the line failure. The LRA omitted this interconnecting piping. This nonsafety-related piping functionally supports the safety-related use of the sump to detect a line failure and therefore is within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2).

The applicant further explained that for the first room, one of the drainlines is a 6-in.-diameter stainless steel line that is routed through a wall penetration to a fixed connection in the cover of a sump in an adjoining room. The room (without the sump) is water tight, so a leak in the room would fill the room to the height of the drain, the drain would then fill the sump, and the sump usage/level instrumentation would enable the leak to be detected. The inlet of this drainline is slightly more than 6 inches above the floor (in the room without a sump), and the piping slopes downward to the sump cover to prevent water from pooling in the line. Therefore, the drainline is dry during normal operating conditions.

For the second room, the applicant stated that the drainline connects the floor drain in the room to a sump in an adjoining area. The room without a sump is a watertight room, and any leak in the room would pass through the drain to the sump, where instrumentation would enable detection of the leak. This drain is 4 inches in diameter. One portion of the drainline is made from cast iron and the remainder, where the line enters the sump, is made from stainless steel. Both portions of the drainline are embedded in concrete. This line is routed from the floor drain to a point several feet above the bottom of the sump in the adjoining room and sloped to prevent water pooling. Leakage in the room is normally insignificant, therefore this line is dry during normal operating conditions.

The applicant included these lines within the scope of license renewal because they directly support the safety function of flooding detection. However, LRA Table 2.3.3.19 is unaffected, since it already includes the applicable component types for these lines. Although the applicant did not identify any credible aging effect that could potentially result in a failure of the drain piping (and surrounding concrete for one line) to direct flow to the sump, it stated that the LW&Ds system AMR summary in LRA Table 3.3.2-19 should have included the information related to the above-mentioned in-scope drain lines.

Furthermore, the applicant explained that, in the event of a fire, drains are available to serve as a support system to remove water used in fire suppression (FSAR Section 9B.4.1.21). However, the drains are a secondary support system to fire suppression. The waste disposal system was neither designed nor installed in accordance with the design specifications for the FP system. In scoping of SSCs for the regulated events of 10 CFR 54.4(a)(3), including FP (10 CFR 50.48), consideration of hypothetical failures or second-, third-, or fourth-level support systems is not required. This is consistent with the NRC's guidance on cascading for 10 CFR 54.4(a)(3), as described in Table 2.1-2 of NUREG-1800. Therefore, the applicant did not include floor drains, equipment drains, or other waste disposal system components in the scope for the regulated event of a fire under 10 CFR 54.4(a)(3).

As part of their review of the implementation of the applicant's scoping and screening methodology, as described in LRA Section 2.1, the NRC inspectors completed a license renewal scoping and screening inspection on May 14, 2004. As a part of its consideration of the applicant's response to RAI 2.3.3.19-4, the staff requested that the inspection team confirm that no credible aging effect that could potentially result in a failure of the drain piping is associated with the LW&Ds system drainlines, which were identified as within scope in the applicant's response and subject to an AMR. As documented in Inspection Report 50-348/2004-007, 50-364/2004-007, dated June 22, 2004, the inspector reviewed the RAI response, verified the environmental conditions in the field, and concluded that, because of the normally dry conditions of the piping, there was no credible aging effect, as stated in the applicant's response to the RAI.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-4 acceptable because it (1) adequately explains the features of the LW&Ds systems credited in FNP's CLB for the prevention of internal flooding, (2) concurs that the drain piping that supports the use of the sump to detect line failure is within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2), and (3) the inspection report verifies that there are no credible aging effects that could result in a failure of the drain piping (and surrounding concrete for one line) to direct flow to the sump. Therefore, the staff considers the concerns described in RAI 2.3.3.19-4 resolved.

RAI 2.0-2E (D-RAI 2.3.3.19-5)

Section 2.3.3.19 of the LRA states that the compartment/room pressure sensors assigned to the FNP LW&Ds system that isolate the CVCS letdown line in the event of a CVCS letdown line rupture are addressed as part of the HELB detection system boundary. Section 2.3.3.17 of the LRA states that the HELB system includes compartment/room pressure and level sensors for the FNP LW&Ds system. However, the license renewal boundary drawings cited for the HELB system do not refer to the LW&Ds system. The staff requested that the applicant clarify why it did not list the LW&Ds system on the license renewal boundary drawings for the HELB system.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that Table B on HELB license renewal boundary drawings D-175039L and D-205039L lists eight instruments with "G21" TPNS designators. System G21 corresponds to the LRA system LW&Ds.

The applicant stated that the HELB detection instruments are listed in a tabular format because there is no connected process piping. The system consists entirely of detection instruments and the associated sensing lines. The instruments are shown within the scope of license renewal on the HELB boundary drawings, assigned to the HELB detection system consistent with the descriptions provided in LRA Sections 2.3.3.17 and 2.3.3.19, and are included on the license renewal boundary drawings referenced in LRA Section 2.3.3.17.

Based on its review, the staff finds the applicant's response to RAI 2.0-2E acceptable because the applicant has clarified that the license renewal boundary drawings refer to the "G21" TPNS designator, which corresponds to the LW&Ds system. Therefore, the staff considers RAI 2.0-2E resolved.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 (discussed in Section 2.2.3) to be acceptable, on the basis that it adequately identified all LW&Ds system's non-safety-related SSCs that are added to the scope of license renewal as a result of the changed 10 CFR 54.4(a)(2) scoping methodology.

2.3.3.19.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the LW&Ds system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the LW&Ds system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.20 Oil-Static Cable Pressurization System

2.3.3.20.1 Summary of Technical Information in the Application

In Section 2.3.3.20 of the LRA, the applicant described the oil-static cable pressurization system. The oil-static cable pressurization system provides pressurized oil for the oil-static cables that are the feeder cables from the 230 kV switchyard to the startup auxiliary transformers. The oil-static cable pressurization system keeps a static pressure of oil on these underground cables. The oil insulates and cools the cables and minimizes cable corrosion. The oil-static cable pressurization system consists of two pumping units, with each unit having two pumps. Each pumping unit has a 1000-gallon-capacity oil supply tank, which has a nitrogen cover gas. One pumping unit supplies the cables for startup auxiliary transformers 1A and 2B, and the other system supplies the cables for startup auxiliary transformers 1B and 2A. The oil-static pump house in the switchyard houses the system components. The system is within the scope of license renewal because it supports operation of the in-scope offsite power supply used to recover from an SBO event.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criterion it used to determine the oil-static cable pressurization system components that are within the scope of license renewal:

- station blackout (10 CFR 54.4(a)(3))

In Table 2.3.3.20 of the LRA, the applicant listed the oil-static cable pressurization system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, piping, pump casings, tanks, and valve bodies.

2.3.3.20.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.20 and FNP FSAR Section 8.2.1.2. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the oil-static cable pressurization system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that passive and long-lived components were not omitted from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.20 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated December 12, 2003, the staff issued RAIs to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated January 9, 2004.

RAI 2.3.3.20-1

License renewal boundary drawing D-372816L shows magnetic level indicators within the scope of license renewal. Magnetic level indicators provide the intended function of pressure boundary and are not listed in LRA Table 2.3.3.20 as a component type subject to an AMR. The staff requested that the applicant clarify if the pressure-retaining boundary of the magnetic level indicators is subject to an AMR. If not, the staff requested that the applicant justify the exclusion of these components from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated January 9, 2004, the applicant responded that the magnetic level indicator consists of a vertical stainless steel pipe with a scale strapped to the outside, and a float inside. Table 2.3.2.20 of the LRA includes the stainless steel pressure boundary subcomponents of the magnetic level indicators in the component type "piping."

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-1 acceptable because it clarifies that LRA Table 2.3.2.20 includes the pressure boundary subcomponents of the magnetic level indicators in the component type "piping" as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers the concerns described in RAI 2.3.3.20-1 resolved.

RAI 2.3.3.20-2

(a) License renewal boundary drawing D-372816L shows unidentified components (1RV2, 1RV1, 2RV2, and 2RV1) within the scope of license renewal. The license renewal P&ID legend for drawing D-175016 does not list these components. The staff requested that the applicant identify these components and clarify if they are subject to an AMR. If not, the staff requested that the applicant justify the exclusion of these components from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

(b) License renewal boundary drawing D-372816L shows unidentified components 1RD and 2RD excluded from the scope of license renewal. The license renewal P&ID legend for drawing D-175016 does not list these components. Although these components provide an intended function of pressure boundary, LRA Table 2.3.3.20 does not include them as component types subject to an AMR. The staff requested that the applicant identify these components and clarify if they are within the scope of license renewal and subject to an AMR. If not, the staff requested that the applicant justify their exclusion from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

(a) By letter dated January 9, 2004, the applicant responded that it created the license renewal boundary drawing for the oil-static cable pressurization system from a vendor drawing. The vendor did not use the standard symbolism depicted on the license renewal drawing legend; therefore, some of the symbols and component identifiers on the oil-static cable pressurization system are not standard. The applicant identified the components addressed by this RAI as relief valves, and the component type "valve bodies" in LRA Table 2.3.3.20 includes these relief valves as subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-2a acceptable because it adequately identifies the components of the oil-static cable pressurization system and clarifies that LRA Table 2.3.3.20 includes these components in the component type "valve bodies" as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers the concerns described in RAI 2.3.3.20-2a resolved.

(b) By letter dated January 9, 2004, the applicant responded that it created the license renewal boundary drawing for the oil-static cable pressurization system from a vendor drawing. The vendor did not use the standard symbolism depicted on the license renewal P&ID legend; therefore, some of the symbols and component identifiers on the oil-static cable pressurization system are not standard. The applicant identified the components (1RD, 2RD) addressed by this RAI as rupture disks (RDs). The applicant stated that the oil storage tanks have a nitrogen cover gas applied to prevent moisture intrusion, not to provide pump suction head, and an RD is provided to protect the tank from overpressure. The applicant concluded that since aging-related failure of the RD could not prevent the oil-static cable pressurization system from supplying oil to the underground cables, the RDs are not within the scope of license renewal and an AMR is not required.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-2b acceptable because it adequately identifies the components of the oil-static cable pressurization system and clarifies the exclusion of this component from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers the concerns described in RAI 2.3.3.20-2b resolved.

2.3.3.20.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff did not identify any omissions. On the basis of its review, the staff concludes that the applicant adequately identified the components of the oil-static cable pressurization system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant adequately identified the components of the oil-static cable pressurization system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.21 Potable and Sanitary Water System

2.3.3.21.1 Summary of Technical Information in the Application

In Section 2.3.3.21 of the LRA, the applicant described the potable and sanitary water (P&SW) system. For the purposes of license renewal, the P&SW system consists of the following FNP systems:

- sanitary water system
- plant hot water heating system

The sanitary water system provides chlorinated or brominated water to the plant for drinking and cleaning purposes. The plant hot water heating system carries water from the plant heating system heat exchanger to various stations within the auxiliary building, including the air handling unit heating coils. These systems are nonsafety-related but are within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2), because of spatial interaction with safety-related SSCs, and because portions of the plant hot water heating system are high energy.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criterion it used to determine the P&SW system components that are within the scope of license renewal:

- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))

In Table 2.3.3.21 of the LRA, the applicant listed the P&SW system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, heat exchanger (channel head), heat exchanger (shell), piping, strainers (shell), tanks, and valve bodies.

In its response to RAI 2.1-1 (discussed in Section 2.1 of this SER), the applicant changed the methodology used for scoping of unattached, nonsafety-related piping for the P&SW system, in accordance with 10 CFR 54.4(a)(2). By letter dated June 4, 2004, the applicant submitted the supplemental information associated with the determination of SSCs within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2), as a result of the changed scoping methodology (see Enclosure 2, “Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4(a)(2)”).

The methodology change expanded the mechanical SSCs within the scope of license renewal. In its supplemental information related to 10 CFR 54.4(a)(2), the applicant listed the impact of changes in the 10 CFR 54.4(a)(2) scoping methodology on the LRA results of the in-scope components for P&SW system. Although this table shows an increase in the in-scope SSCs for the P&SW system, the applicant stated that the component types do not change from the component types listed in LRA Table 2.3.3.21.

2.3.3.21.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.21 and FNP FSAR Section 9.2.4. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the P&WS system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then conducted a review, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant did not omit passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff’s review of LRA Section 2.3.3.21 identified an area in which it needed additional information to complete the evaluation of the applicant’s scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued an RAI to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff’s RAI and the applicant’s response, dated April 7, 2004.

<u>RAI 2.3.3.21-1</u>

The P&SW system is non-safety-related but is within the scope of license renewal because of the potential for spatial interaction with safety-related components, per 10 CFR 54.4(a)(2). Table 2.3.3.21 of the LRA lists the component types subject to an AMR. However, LRA Section 2.3.3.21 does not provide or reference any license renewal boundary drawings associated with the P&SW system. Section 9.2.4.2 of the FNP FSAR states that drawing D-170127 shows the P&ID for the P&SW system. However, the applicant did not provide this drawing to the staff for review.

The staff requested that the applicant provide a description or license renewal boundary drawing to identify the components of the P&SW system that are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that the P&SW system includes the sanitary water system and plant hot water heating system. The sanitary water system supplies domestic water for use throughout the plant. The plant hot water heating system carries water for the plant heating system heat exchanger to air handling heating coils located throughout the auxiliary building. The plant hot water heating system is within scope for high-energy line consideration, and other portions of the P&SW system are within the scope of license renewal for spatial interaction, in accordance with 10 CFR 54.4(a)(2).

In response to the staff's request to identify the components of the P&SW system that are within the scope of license renewal and subject to an AMR, the applicant stated that LRA Table 2.3.3.21 lists the component types subject to an AMR, and LRA Table 3.3.2-21 identifies the applicable material and environment combinations for these components. The applicant further listed closure bolting, piping components (piping, fittings, etc.), valves, heat exchangers, strainer (shell), and tanks for the in-scope portion of plant hot water system. The applicant stated that the in-scope portion of the sanitary water system within the scope of license renewal includes closure bolting, piping components (piping, fittings, etc.), valves, and tanks.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1 acceptable because it adequately identifies the intended function of the subsystems of the P&SW system (sanitary water system and plant hot water heating systems) and also lists the components of the plant hot water heating and sanitary water systems that are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers the concerns described in RAI 2.3.3.21-1 resolved.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 (discussed in Section 2.2.3) to be acceptable, on the basis that it adequately identified all P&SW system's non-safety-related SSCs that are added to the scope of license renewal as a result of the changed 10 CFR 54.4(a)(2) scoping methodology.

2.3.3.21.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the P&SW system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the P&SW system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.22 Radiation Monitoring System

2.3.3.22.1 Summary of Technical Information in the Application

In Section 2.3.3.22 of the LRA, the applicant described the radiation monitoring system. The radiation monitoring LRA system consists of the FNP process and area radiation monitoring systems. The radiation monitoring systems at FNP are grouped into three categories:

- process and effluent radiological monitoring, which includes both continuous process and periodic sampling systems

- area radiation monitoring, which monitors radiation fields in various areas within the plant

- airborne radioactivity monitoring, which monitors specific areas of the plant to ensure that in-plant airborne radioactive materials concentrations are controlled during normal plant activities, such that limits stated in 10 CFR Part 20 will not be exceeded

The airborne radioactivity monitoring is a nonsafety-related function that is not within the scope of license renewal. The process and effluent radiological monitoring portion of the system is used to monitor process and effluent streams during normal operations and postulated accidents to provide indication and record releases of radioactive materials generated and to initiate automatic system responses. The in-scope portions are addressed as part of the system that includes the process or effluent being monitored.

Area radiation monitors are standalone monitors and addressed in the scoping and screening results for the electrical and I&C systems along with the process and effluent radiological monitors.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria used to determine the radiation monitoring system components that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- environmental qualification (10 CFR 54.4(a)(3))

2.3.3.22.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.22 and FNP FSAR Sections 11.4 and 12.2.4. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the radiation monitoring system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant did not omit passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.22 identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued an RAI to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of

10 CFR 54.21(a)(1). The following describes the staff's RAI and the applicant's response, dated April 7, 2004.

RAI 2.3.3.22-1

Section 2.3.3.22 of the LRA states the following:

> The process and effluent radiological monitoring portion of the radiation monitoring system is used to monitor process and effluent streams during normal operations and postulated accidents to provide indication and record releases of radioactive materials generated and to initiate automatic system responses. The in-scope portions are addressed as part of the LRA system that includes the process or effluent being monitored.

The in-process radiation monitoring elements shown on the license renewal boundary drawings for the closed-cycle cooling water and open-cycle cooling water systems are installed in line and, therefore, serve the intended function of pressure boundary. However, the applicant did not list these components in the LRA tables as subject to an AMR. Section 2.3.3.22 of the LRA does not list the systems that contain the process or effluent being monitored, nor does it reference any boundary drawings associated with the radiation monitoring system. Therefore, the staff could not confirm that the SSCs meeting the requirements of 10 CFR 54.4(a) are included within the scope of license renewal. The staff requested that the applicant provide a list of the LRA systems which includes the process or effluent being monitored by components of the radiation monitoring system.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant stated that the radiation monitors installed in line on an in-scope portion of a process system serve the intended function of pressure boundary and are therefore within the scope of license renewal. The scoping results for the mechanical system being monitored include these radiation monitors. The applicant also clarified that, for radiation monitors installed in line on an in-scope portion of a process system, the items are treated the same as piping or ductwork fittings and are included in the component type "piping" for piping applications, and in the component type "ducts and fittings" for ventilation applications, and are subject to an AMR.

In response to the staff's request, the applicant developed a table which lists the LRA systems that includes the process or effluent being monitored by components of the radiation monitoring system. This table lists those radiation monitors that are part of a mechanical LRA system's in-scope pressure boundary.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.22-1 acceptable because it adequately identifies the systems which include the process or effluent monitored by components of the radiation monitoring system and clarifies that, for radiation monitors installed in line on an in-scope portion of a process system, the items are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.22-1 resolved.

2.3.3.22.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the radiation monitoring system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant adequately identified the components of the radiation monitoring system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.23 Reactor Makeup Water Storage System

2.3.3.23.1 Summary of Technical Information in the Application

In Section 2.3.3.23 of the LRA, the applicant described the reactor makeup water storage (RMWS) system. The RMWS system provides nonborated makeup water for the RCS and makeup and flushing water for various other components. The RMWS system provides an assured seismic Category I makeup source to the component cooling water system surge tank and to the SFP as its license renewal intended function.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria met by the reactor makeup water system components which are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))

In Table 2.3.3.23 of the LRA, the applicant listed the RMWS system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, flow orifice/element, piping, pump casings, tanks, and valve bodies.

In its response to RAI 2.1-1 (discussed in Section 2.1 of this SER), the applicant changed the methodology used for scoping of unattached, nonsafety-related piping for the RMWS system in accordance with 10 CFR 54.4(a)(2). By letter dated June 4, 2004, the applicant submitted the supplemental information associated with the determination of SSCs within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2), as a result of the changed scoping methodology (see Enclosure 2, “Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4(a)(2)”).

The methodology change expanded the mechanical SSCs within the scope of license renewal. In its supplemental information related to 10 CFR 54.4(a)(2) the applicant listed the impact of changes in the 10 CFR 54.4(a)(2) scoping methodology on the LRA results of the in-scope components for the RMWS system. Although this table shows an increase in the in-scope SSCs for the RMWS system, the applicant stated that the component types do not change from the component types listed in LRA Table 2.3.3.23.

2.3.3.23.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.23 and FNP FSAR Sections 9.2.7, 9.3.4, 9.1.3.3, and 9.2.2.2. The staff conducted its review, using the evaluation methodology described in Section

2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant had not identified all system functions in the LRA as an intended function of the RMWS system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant did not omit passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.23 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued RAIs to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 22, 2004.

RAI 2.3.3.23-1

In FNP FSAR Section 9.2.7.2.1, the applicant stated that the RMWS tank contains a diaphragm membrane, and the Unit 1 tank contains a 150-gal/min recirculating vacuum degasifier to exclude oxygen from the makeup water. License renewal boundary drawings D-175036L, D-205036L, D-170118L, and D-200012L depict the diaphragm as used in the reactor water makeup and condensate storage tanks (CSTs). License renewal boundary drawing D-205036L shows the diaphragm within the scope of license renewal. However, license renewal boundary drawings D-175036L, D-170118L, and D-200012L exclude the diaphragm from the scope of license renewal. In addition, LRA Table 2.3.3.23 does not list these diaphragms as component types subject to an AMR. These diaphragm membranes provide an intended function of pressure boundary for the RMWS tanks and are passive, long-lived components. The staff requested that the applicant justify the exclusion of the RMWS tank diaphragms for Units 1 and 2 (with the exception of the one shown on license renewal boundary drawing D-205036L) from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). In addition, the staff requested that the applicant explain why LRA Table 2.3.3.23 does not list these components as component types subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the stainless steel RMWS tanks contain a diaphragm membrane that excludes oxygen from the makeup water. These diaphragms do not perform an intended function for license renewal.

The applicant added that the failure of the diaphragm would not result in the loss of any safety-related function. Should the diaphragm become perforated, the reactor makeup water in the tank remains available to provide adequate makeup to the closed-cycle cooling water surge tank and SFP. The tank and connecting piping provides the pressure boundary for the RMWS systems. The applicant concluded that boundary drawings D-175036L, D-170118L, and D-200012L correctly show the diaphragm as excluded from the scope of license renewal. However, boundary drawing D-205036L incorrectly highlighted the diaphragm as within the scope of license renewal.

During a telephone conference on May 24, 2004, between the applicant and the NRC staff, the staff requested that the applicant clarify whether the disintegration of the diaphragm membrane could cause blockage of the supply lines from the RMWS tanks to the closed-cycle cooling water system.

By letter dated June 18, 2004, the applicant, in its revised response, stated that the diaphragm membranes would not degrade (disintegrate) to the point where blockage of the supply lines could occur. In its response, the applicant stated that, although these nonsafety-related diaphragms would not fail in a manner that would prevent accomplishment of a safety-related function, the applicant's review of the industry and site-specific operating experience identified that age-related degradation of elastomer-type tank diaphragms is a reasonable expectation for the period of extended operation. At FNP, the applicant has replaced these tank diaphragms with diaphragms made of improved materials due to degradation. Therefore, the applicant decided to include the tank diaphragms in an aging management program (AMP) to provide additional assurance.

The applicant expanded the scope of this response to include the diaphragm membranes of the CSTs and the boric acid tanks, in addition to the RMWS tanks, because these tanks are within the scope of license renewal and have similar elastomer diaphragms subject to the same concern. The AFW system (LRA Section 2.3.4.4) includes the CSTs, and the CVCS (LRA Section 2.3.3.8) includes the boric acid tanks. Therefore, the applicant concurred that LRA Tables 2.3.3.8, 2.3.3.23, and 2.3.4.4 should have included the tank diaphragms as a component type within the scope of license renewal and subject to an AMR. As a result, the applicant also provided additional information to supplement the scoping, AMR results, and AMP discussions in the application.

Based on its review, the staff finds the applicant's revised response to RAI 2.3.3.23-1 acceptable because it concurred that the diaphragm membranes in the RMWS tanks should have been within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers RAI 2.3.3.23-1 resolved.

<u>RAI 2.3.3.23-2</u>

(a) License renewal boundary drawings D-170118L and D-200012L show a 3-in. ventline (HCD-262) and a 3-in. nitrogen purge line (HCD-263) excluded from the scope of license renewal. These lines serve the intended function of pressure boundary. The staff requested that the applicant justify the exclusion of these lines from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

(b) License renewal boundary drawings D-170118L and D-200012L show 1-in. pipelines, connected to a level controller (MK274 and MK774) excluded from the scope of license renewal. These lines serve the intended function of pressure boundary. The staff requested that the applicant justify the exclusion of these lines from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

(a) By letter dated April 22, 2004, the applicant responded that tank connections for the 3-in. ventline and the 3-in. nitrogen purge line are used during the filling operation of the RMWS tank to evacuate air underneath the diaphragm. These lines are located 3'-6"' above the normal water level in the tank and do not provide a pressure boundary for the required inventory of the reactor makeup water in the tank. Therefore, they are excluded from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

    Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-2a acceptable because it adequately explains the basis for excluding the ventline and the nitrogen purge line from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. Therefore, the staff considers the concerns described in RAI 2.3.3.23-2a resolved.

(b) By letter dated April 22, 2004, the applicant responded that, through further evaluation of the level controller lines addressed in the RAI, it has determined that these lines serve the intended function of pressure boundary, relative to maintaining the pressure boundary of the RMWS tank, and are within the scope of license renewal. The applicant also stated that the 1-in. stainless steel piping and the level controllers are the only component types in these lines. The level controllers are not subject to an AMR since they are active components. However, the piping is passive and long-lived and is already identified in LRA Table 2.3.3.23 as a component type subject to an AMR with the intended function of pressure boundary.

    Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-2b acceptable because the applicant concurred that the level controller lines addressed in the RAI are within the scope of license renewal and are included in LRA Table 2.3.3.23 in the component type "piping" as being subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. The applicant also clarified that the level controllers are active components and are therefore not subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.3.23-2b resolved.

RAI 2.3.3.23-3

License renewal boundary drawings D-175036L and D-205036L show the license renewal boundary for this system to end at valves Q1G22V063A, Q1G22V063B, Q2G22V063A, and Q2G22V063B. These valves appear to be normally open, and a piping class change occurs at this valve. Normally open manual valves can be used as a license renewal pressure boundary if failure of the downstream piping has no short-term effects, can be quickly detected, and will be closed by the operators before any adverse consequences occur. The staff requested that the applicant explain why it is acceptable to terminate the license renewal boundary at these normally open valves.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the piping associated with the open valves identified in the RAI consists of reactor makeup water providing seal water to the waste gas compressor (WGC). This reactor makeup water supply to the WGC is not an in-scope function for the system. The waste processing system has no safety-related function, and there are no in-scope functions for the waste gas system. The valve alignment depicted on the boundary drawing assumes the system is aligned to support waste gas system operation.

The applicant added that the RMWS system is within the scope of license renewal as a source of long-term makeup water for the component cooling water system surge tank and for the SFP. The makeup supply from the RMWS system to the component cooling water surge tank addresses loss of inventory from minor leakage sources during long-term postaccident recovery in the event the demineralized water system is unavailable. The use of the RMWS system for makeup water to the SFP by the use of the temporary hose connection is also a long-term recovery action in the unlikely event of a failure of both safety-related trains of the SFP cooling system and the demineralized water system.

In response to the staff's request to explain why it is acceptable to terminate the license renewal boundary at these normally open valves, the applicant explained that the 3/4-in. piping downstream of the isolation valves (Q2G22V063A and Q2G22V063B) is located outside of the WGC rooms as well as inside the rooms. Failure of this line has no short-term effects—the WGC equipment is not safety-related, and there is no short-term need for makeup water to the component cooling water surge tank or SFP.

The applicant also stated that the detection of the leak depends on the size of the leak. In the event of a complete failure equivalent to a 3/4-in. line break, the flow out of the break would reduce the level in the RMWS tank slowly, given the large capacity of the tank (approximately 200,000 gallons). The unusual increase in waste tank/sump levels or from the changes in RMWS tank level and associated alarm readings would lead to detection of the reduction in level. The leak would be isolated before any inventory loss that would occur would compromise the intended function of the RMWS because of the large capacity of the RMWS tank and the small size of the potential leak (3/4 in.).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-3 satisfactory, because it adequately explains that it is acceptable to terminate the license renewal boundary at the normally open valves addressed in the RAI because failure of 3/4-in. piping downstream of the isolation valves (Q2G22V063A and Q2G22V063B) would not compromise the intended function of the RMWS system. Therefore, the staff considers RAI 2.3.3.23-3 resolved.

As part of its review of the implementation of the applicant methodology, as described in LRA Section 2.1, the NRC inspectors completed a license renewal scoping and screening inspection on May 14, 2004, which is documented in Inspection Report 50-348/2004-007, 50-364/2004-007, dated June 22, 2004. The inspection consisted of a selected examination of procedures and representative records and interviews with personnel regarding the process of scoping and screening plant components to select components subject to an AMR. Additionally, the NRC inspectors performed a walkdown of selected areas of the plant containing SSCs that are considered to be within the scope of license renewal because they meet the 10 CFR 54.4(a)(2) requirement. For a sample of plant systems, specifically those that the NRC reviewers identified, the NRC inspectors performed visual inspection of accessible portions of the systems to observe any effects of component aging.

The inspectors concluded that the applicant had successfully performed scoping and screening and identified the SCs subject to an AMR, in accordance with the methodology described in the LRA and the license renewal rule, with the following exception.

The inspectors noted that boundary drawings were inconsistent on various drawings in depicting the atmospheric vents for the refueling water storage, condensate storage, and the RMWS tanks as in or out of the scope of license renewal.

By letter dated July 9, 2004, the applicant provided supplemental information to the atmospheric vents on the RWSTs, CSTs, and RMWS tanks. In this supplement, the applicant agreed to include these vents in the scope of license renewal. The applicant stated that these vent lines are considered an integral subpart of the tanks and, consequently, are lumped into the existing "tank" component type. Therefore, the component types in the AMR tables in the corresponding LRA scoping sections are unaffected. However, the applicant stated that the AMR summary tables should have included additional material-environment combinations for the tanks as a result of bringing the tank vents into scope and provided the additions to the corresponding AMR summary tables.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 (discussed in Section 2.2.3) to be acceptable, on the basis that it adequately identified all RMWS system's non-safety-related SSCs that are added to the scope of license renewal as a result of the changed 10 CFR 54.4(a)(2) scoping methodology.

2.3.3.23.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the RMWS system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the RMWS system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.24 Sampling System

2.3.3.24.1 Summary of Technical Information in the Application

In Section 2.3.3.24 of the LRA, the applicant described the sampling system. The sampling system is designed to permit liquid and gaseous sampling for analysis and chemistry control of the plant primary and secondary system fluids. It allows the needed samples to be obtained under both normal operation and shutdown conditions. Portions of the system also support postaccident sampling.

Portions of the system that are within the scope of the license renewal rule support the pressure boundary function of the safety-related system being sampled, provide containment isolation where the sample system penetrates the containment boundary, and/or provide manual sampling to ensure that the boration to cold shutdown margin is achieved for safe shutdown under Appendix R to 10 CFR Part 50. In addition, the sample lines for SGBD, the pressurizer, and the reactor coolant hot leg isolate automatically on high penetration room pressure to support maintaining the negative pressure required for the penetration room filtration (PRF) function.

In Table 2.2-1c of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the sampling system components that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))

In Table 2.3.3.24 of the LRA, the applicant listed the sampling system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, heat exchanger (shell), heat exchanger (tubes), piping, and valve bodies.

2.3.3.24.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.24 and FSAR Section 9.3.2. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the sampling system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant had not omitted passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.24 identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued an RAI determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI and the applicant's response, dated April 22, 2004.

<u>RAI 2.3.3.24-1</u>

License renewal boundary drawings D-175009L and D-205009L show gross failed fuel detectors within the scope of license renewal. However, LRA Table 2.3.3.24 does not list gross failed fuel detectors as a component type subject to an AMR. The gross failed fuel detector housing serves the intended function of pressure boundary and is within the scope of license renewal. The staff requested that the applicant clarify if the pressure boundary retaining components of the gross failed fuel detectors are subject to an AMR. If not, the staff asked the applicant to justify their exclusion from an AMR, in accordance with the requirements of

10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the gross failed fuel detector is an assembly with the pressure boundary component types individually scoped, screened, and an AMR performed. The subcomponents of the gross failed fuel detector assembly (with component type indicated in parentheses) that provide a pressure boundary function include tubing (piping), valves (valve bodies), sample cooler tubing (sample cooler heat exchanger tubes), and neutron detector coil tubing (piping). Tables 2.3.3.24 and 3.3.2-24 of the LRA include these components under the component types indicated.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.24-1 acceptable because it adequately identifies the subcomponents of the gross failed fuel detector assembly that serve the intended function of pressure boundary and clarifies that LRA Table 2.3.24 includes these subcomponents in the component types "piping," "valve bodies," and "sample cooler heat exchanger tubes" as subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers the concerns described in RAI 2.3.3.24-1 resolved.

2.3.3.24.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant did not identify all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the sampling system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the sampling system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4 Steam and Power Conversion Systems

This section addresses the staff's review of the results of the scoping and screening methodology for steam and power conversion systems, which consist of the following:

- main steam system
- feedwater system
- steam generator blowdown system
- auxiliary feedwater system
- auxiliary steam and condensate recovery system
- turbine and turbine auxiliaries

In accordance with the requirements stated in 10 CFR 54.21(a)(1), the applicant must identify and list SCs subject to an AMR. These are passive, long-lived SCs that are within the scope of license renewal. To verify that the applicant properly implemented its methodology, the staff reviewed the scoping and screening results to confirm that the applicant did not omit any mechanical system components that are subject to an AMR.

2.3.4.1 Main Steam System

The main steam LRA system comprises the main steam system, auxiliary steam system, and portions of the feedwater control system.

2.3.4.1.1 Summary of Technical Information in the Application

In Section 2.3.4.1 of the LRA, the applicant described the main steam LRA system. The main steam system conducts steam from the steam generators to the turbine generator and to supporting components, including the MSRs, steam jet air ejectors, gland sealing steam system, auxiliary steam system, and steam generator feed pump turbines. The main steam system also supplies steam via the auxiliary steam system to the turbine-driven AFW pump. The portions of the main steam system from each steam generator, up to and including the MSIVs and the supply to the turbine-driven AFW pump, are necessary for the safe shutdown of the plant and accident mitigation.

The main steam LRA system boundary includes the level and flow instrumentation attached to the steam generator, although otherwise classified as part of the feedwater control system, because it forms part of the main steam system pressure boundary and provides input to the reactor protection system.

The first-stage turbine impulse pressure sensing lines and associated transmitters provide input to the reactor protection system and ATWS mitigation system actuation circuitry (for mitigation of an ATWS event) and are included in the scope of the main steam system boundary.

The applicant addressed the compartment/room pressure sensors, provided in areas affected by a rupture of an auxiliary steam supply line to the turbine-driven AFW pump and assigned to the auxiliary steam system, separately as part of the HELB detection LRA system boundary.

In Table 2.2-1d of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria used to determine the main steam LRA system components that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))

In Table 2.3.4.1 of the LRA, the applicant listed the main steam system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, flow orifice/element, piping, steam/fluid traps, turbine pump drive casings, and valve bodies.

2.3.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.1 and FNP FSAR Sections 10.1, 10.3, and 7.8. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant had identified all system functions in the LRA as an intended function of the main steam system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant had not omitted passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.4.1 identified areas in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued RAIs determine whether the applicant had properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 23, 2004, and June 18, 2004.

RAI 2.3.4.1

License renewal boundary drawings D-175033L and D-205033L show air reservoirs within the scope of license renewal. Air reservoirs serve the intended function of pressure boundary and are passive, long-lived components. However, LRA Table 2.3.4.1 does not include air reservoirs as a component type subject to an AMR. The staff concluded that the air reservoirs serve a pressure boundary intended function and are passive, long-lived components. The staff requested that the applicant justify the exclusion of air reservoirs from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that these air reservoirs are an integral part of the valve operator, directly support the active function of the operator, and are included as part of the valve operator component for license renewal. The valve operator only performs an active function and, therefore, is not subject to an AMR. Age-related degradation of the valve operator is managed under the requirements of the Maintenance Rule.

During a telephone conference between the applicant and the NRC staff on May 24, 2004, the staff agreed to consolidate RAI 2.3.3.5-1a, RAI 2.3.3.5-1b, RAI 2.3.4.1-1, and portions of RAI 2.2-5b for the pneumatic valve operator air tanks to a revised RAI 2.2-5b, since the applicant's responses to these RAIs were related to the integral parts of valve operators. Therefore, by letter dated June 25, 2004, the staff issued the revised RAI 2.2-5b. Section 2.2.3 of this report describes the revised RAI 2.2-5b, the applicant's response, and the staff evaluations.

RAI 2.3.4.1-2

Table 2.3.4.1 of the LRA lists steam/fluid traps as a component type subject to an AMR. However, the only steam/fluid traps appearing on the license renewal boundary drawings D-175033L and D-205033L are excluded from the scope of license renewal. The staff requested that the applicant identify the in-scope steam traps referred to in LRA Table 2.3.4.1.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the steam traps listed in LRA Table 2.3.4.1 are solely within the scope of license renewal under 10 CFR 54.4(a)(2) and, as such, are not highlighted on the license renewal boundary drawings. The applicant also provided the identification numbers for eight steam traps (per unit) within the scope of license renewal and shown on license renewal boundary drawings referenced in LRA Section 2.3.4.1.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.1-2 acceptable because it adequately explains that the steam traps are not highlighted on the license renewal boundary drawings because they are within scope solely in accordance with 10 CFR 54.4(a)(2). The applicant then specifically identifies the in-scope steam traps on these drawings. Therefore, the staff considers the concerns described in RAI 2.3.4.1-2 resolved.

RAI 2.3.4.1-3

License renewal boundary drawings D-170114L and D-200007L show a component represented by a dashed line symbol. However, the drawing D-175016 Units 1 and 2 standard P&ID legend does not define this particular dashed line. The staff requested that the applicant identify the components represented by this dashed line and explain how the applicant considered them in the scoping and screening process.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that the dashed lines addressed in the RAI represent piping by others. The applicant further explained that the symbol used was not an exact match with the symbol for piping by others shown in the drawing legend because of variations in symbolism between different vendors.

In response to the staff's request about how it considered the components represented by the dashed line in the scoping and screening process, the applicant stated that it considered the piping in the scoping and screening process using the methodology described in LRA Section 2.1 and excluded it from the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.1-3 acceptable because the applicant identified the components represented by the dashed line and explained that it considered these components in the scoping and screening process using the methodology described in LRA Section 2.1. Therefore, the staff considers RAI 2.3.4.1-3 resolved.

2.3.4.1.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the main steam LRA system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the main steam LRA system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.2 Feedwater System

The feedwater LRA system comprises the condensate and feedwater system, feedwater control system, chemical injection system, and portions of the AFW system.

2.3.4.2.1 Summary of Technical Information in the Application

In Section 2.3.4.2 of the LRA, the applicant described the feedwater LRA system. The condensate and feedwater system returns condensed steam from the main condenser through the feedwater heaters to the steam generators. The feedwater control system modulates the feedwater flow rate to control levels in the steam generators during normal and transient conditions and isolates feedwater system flow when required during abnormal conditions. The main feedwater control valves and main feedwater bypass control valves are part of the feedwater control system.

The chemical injection system allows for the addition of chemicals to the feedwater fluid to minimize corrosion in the feedwater system and in the steam generators.

The portion of the AFW system that interfaces with the main feedwater lines up to and including the first isolation valve forms an integral part of the normal feedwater pressure boundary and has been included as part of the feedwater LRA system. The remainder of the system comprises the AFW LRA system.

The condensate and feedwater system from the feedwater isolation valves to the steam generators is safety related and an integral part of the AFW flowpath pressure boundary for providing emergency feedwater to the steam generators. This portion of the system and the portions of the chemical injection and AFW systems that interface with the main feedwater lines up to the first isolation valves provide containment isolation and steam generator isolation pressure boundary functions, as well as support to the AFW flowpath. Rapid and redundant isolation of the main feedwater lines to prevent sustained high flow is accomplished via tripping the main feedwater pumps and automatic closure of the main feedwater control valves and main feedwater bypass control valves, in addition to closure of the feedwater isolation valves.

The LRA addresses level sensors, provided in the main steam valve room to detect flooding indicative of a line rupture and assigned to the condensate and feedwater system, separately as part of the HELB detection LRA system boundary.

In Table 2.2-1d of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the feedwater system components that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))

In Table 2.3.4.2 of the LRA, the applicant listed the feedwater system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, piping, and valve bodies.

In its response to RAI 2.1-1 (discussed in Section 2.1 of this SER), the applicant changed the methodology used for scoping of unattached, non-safety-related piping for the feedwater system in accordance with 10 CFR 54.4(a)(2). By letter dated June 4, 2004, the applicant submitted the supplemental information associated with the determination of SSCs within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2), as a result of the changed scoping methodology (see Enclosure 2, "Joseph M. Farley Nuclear Plant Units 1 and 2, Application for License Renewal, Supplemental Information Related to 10 CFR 54.4(a)(2)").

The methodology change resulted in an expansion of the mechanical SSCs within the scope of license renewal. In its supplemental information related to 10 CFR 54.4(a)(2), the applicant listed the impact of changes in the 10 CFR 54.4(a)(2) scoping methodology on the LRA results of the in-scope components for the feedwater system. In Enclosure 2 of the letter, the applicant stated that changes in the 10 CFR 54.4(a)(2) scoping methodology affect a portion of the chemical addition system (addressed as part of the feedwater LRA system in the application). The portion of the chemical addition system that is located in the auxiliary building on the 100' elevation is of concern. The system is normally unused (it is occasionally used for batch processing of wet lay-up chemicals) and unpressurized. When used, the system is operated locally such that any leak in the area containing the safety-related SSCs would be immediately detected and the operation stopped.

A through-wall failure in the system components on the discharge side of the system pumps could expose vulnerable safety-related SSCs in the space to the treated water of the system. Therefore, the applicant indicated the discharge-side lines in the scope of the license renewal and evaluated them for aging effects that require management.

The chemical addition system is supplied from the CST, and the supply line runs in the same room as safety-related components. Since the supply-side of the system is left unpressurized (isolated), a spray from a failure in these components is not postulated. None of the supply-side components are routed above non-safety-related SSCs that are vulnerable to a leak. Room drainage is available; therefore, leakage would not lead to a flooding event that would compromise the safety-related components in the area. Similarly, leakage from the chemical addition tanks (100 gallon capacity) or skid components (on the supply side of the pumps) would not cause a flood in the lower equipment room or connected rooms that would lead to a failure of a SR component.

Because of the expanded scope, the applicant stated that it included the chemical addition pump casings and the pump discharge-side line within the scope of license renewal and evaluated them for aging effects that required management. Tables 2.3.4.2 and 3.4.2-2 of the LRA should include the component type "pump casings."

2.3.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.2 and FNP FSAR Sections 10.47 and 10.3.5. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER, to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the feedwater system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant did not omit any passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff found that the applicant included those portions of the feedwater system that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal, and identified them as such in LRA Section 2.3.4.2, and included the feedwater system components that are subject to an AMR in accordance with 10 CFR 54.21(a)(1) in LRA Table 2.3.4.2. The staff did not identify any omissions.

The staff finds the supplemental information related to 10 CFR 54.4(a)(2) in the June 4, 2004, Enclosure 2 (discussed in Section 2.2.3) to be acceptable, on the basis that it adequately identified all feedwater system's non-safety-related SSCs that are added to the scope of license renewal as a result of the changed 10 CFR 54.4(a)(2) scoping methodology.

2.3.4.2.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the feedwater LRA system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the feedwater system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.3 Steam Generator Blowdown System

2.3.4.3.1 Summary of Technical Information in the Application

In Section 2.3.4.3 of the LRA, the applicant described the steam generator blowdown (SGBD) system. This system provides a continuous blowdown of water from the lower portion of each steam generator tube bundle to remove solids and chemical contaminants that accumulate in the steam generators during normal operations. Removing these impurities helps maintain proper water chemistry and minimizes corrosion on the secondary side of the steam generators. The blowdown from each steam generator flows under pressure into a common manifold and then to a heat exchanger, where the temperature is reduced before processing the effluent.

Portions of the SGBD system are brought into scope for containment isolation (where the SGBD piping penetrates containment) and as a result of the potential for spatial interaction with safety-related SSCs. The SGBD lines from the steam generators to the processing system are high-energy lines. High-energy line break room pressure sensors isolate blowdown from the steam generators if a rupture is detected. The applicant addressed the compartment/room pressure sensors separately as part of the HELB detection LRA system boundary.

In Table 2.2-1d of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the SGBD system components that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- anticipated transient without scram (10 CFR 54.4(a)(3))

In Table 2.3.4.3 of the LRA, the applicant listed the SGBD system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, piping, and valve bodies.

2.3.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.3 and FNP FSAR Section 10.4.9. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the SGBD system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify the applicant had not omitted passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.4.3 identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued an RAI to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI and the applicant's response, dated April 22, 2004.

<u>RAI 2.3.4.3-1</u>

License renewal boundary drawing D-175071L for the SGBD shows that the only portion of the SGBD system that is within the scope of license renewal in accordance with 10 CFR 54.4(a)(1) extends from the steam generators to the containment isolation valves. According to LRA Section 2.3.4.3, other portions of the system are brought into scope under 10 CFR 54.4(a)(2). However, the LRA does not identify the specific portions and their components.

Section 10.4.8.2 of the FNP FSAR states that in the event that radiation monitors in the system detect a high level of activity in the blowdown fluid, a control valve downstream of the SGBD heat exchanger will trip closed, providing automatic isolation of the system. However, the FSAR does not identify the specific location of this blowdown isolation valve. Because this valve performs an isolation function, and all components upstream of it (to the containment isolation valves) perform the intended function of pressure boundary, the staff concludes that these components should be within the scope of license renewal and subject to an AMR.

The staff requested that the applicant provide the location of the above-mentioned blowdown isolation valve and justify the exclusion of this valve and all components upstream (to the containment isolation valves) from the scope of license renewal and from an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant's Response and Staff's Evaluation

By letter dated April 22, 2004, the applicant responded that three different types of valves can automatically isolate the SGBD system—(1) the containment isolation valves which close on a containment isolation signal, (2) a set of two valves located upstream of the containment isolation valves (already in scope under 10 CFR 54.4(a)(1)) which close on a high room-pressure signal caused by an HELB, (3) and a third valve which closes on a high radiation signal and functions to minimize releases during normal plant operations to meet 10 CFR Part 20 ALARA requirements. This third valve and the components upstream of it (to the containment isolation valves) are excluded from the scope of license renewal under 10 CFR 54.4(a)(1) because the portion of the SGBD system downstream of the containment isolation valves is not safety related, and this valve is utilized only during normal operations. However, the applicant added that the portion of the SGBD system between the containment isolation valves and the SGBD heat exchanger is within the scope of license renewal under 10 CFR 54.4(a)(2) because of potential spatial interactions with safety-related components; therefore, it is not highlighted on the license renewal boundary drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.3-1 acceptable because it adequately explains the various isolation functions associated with the SGBD system and explains the basis for (1) excluding the portion of the system located downstream of the containment isolation valves (up to the SGBD heat exchanger) from the scope of license renewal under 10 CFR 54.4(a)(1), and (2) including the portion of the SGBD system between the containment isolation valves and the SGBD heat exchanger within the scope of license renewal under 10 CFR 54.4(a)(2). Therefore, the staff considers the concerns described in RAI 2.3.4.3-1 resolved.

2.3.4.3.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the SGBD system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the SGBD system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.4 Auxiliary Feedwater System

The systems that comprise the auxiliary feedwater (AFW) LRA system include the AFW system and the condensate storage tank (CST) portion of the condensate and demineralized water transfer and storage system.

2.3.4.4.1 Summary of Technical Information in the Application

In Section 2.3.4.4 of the LRA, the applicant described the AFW LRA system. The AFW system is designed to supply feedwater to the steam generators during startup, cooldown, and emergency conditions. Two motor-driven and one turbine-driven AFW pumps ensure the availability of the required feedwater flow to the steam generators. During normal operations, the system is in a standby mode, with controls selected for automatic operation.

The condensate and demineralized water transfer and storage system stores water in the CST to provide makeup and surge capacity to compensate for changes in the turbine plant systems inventory and to provide a supply of water for the AFW system for shutdown decay heat removal. The lower portion of the tank is designed to ensure that 150,000 gallons remain in the tank for emergency use. The applicant addressed the demineralized water transfer and storage portion of the system as part of the demineralized water LRA system.

The AFW system is relied upon as the source of feedwater supply to the steam generators to maintain a secondary heat sink for DBE mitigation, and therefore the SCs that perform this function are safety related. The CST provides the feedwater source for the AFW system for normal and DBE mitigation. The service water system can also supply the AFW system if needed. However, this system is not credited for mitigation of any DBE.

In Table 2.2-1d of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the AFW LRA system components that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))

In Table 2.3.4.4 of the LRA, the applicant listed the AFW LRA system component types that are within the scope of license renewal and subject to an AMR, including closure bolting, filters (casing), flow orifice/element, oil cooler (shell), oil cooler (channel head), oil cooler (tubesheet), oil cooler (tubes), piping, pump casings, CSTs, and valve bodies.

2.3.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.4 and FNP FSAR Sections 6.5 and 9.2.6. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the AFW system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant did not omit passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff’s review of LRA Section 2.3.4.4 identified areas in which it needed additional information to complete the evaluation of the applicant’s scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued RAIs to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAIs and the applicant's responses, dated April 7, 2004.

RAI 2.3.4.4-1

Section 6.5.2.2.2 of the FNP FSAR states that a forced-feed lube oil system driven from the turbine shaft lubricates the AFW turbine bearings. Several of the components listed in LRA Table 2.3.4.4 compose part of the turbine lube oil subsystem. Since the AFW pump turbine drive must be operable for the AFW system to perform its intended function, the staff considers the turbine lube oil subsystem to be within the scope of license renewal. However, license renewal boundary drawings D-175007L, D-205007L, D-175033L, and D-205033L do not show the turbine lube oil subsystem and its components.

The staff requested that the applicant confirm that all components of the turbine lube oil subsystem (AFW system) are within the scope of license renewal and subject to an AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively, or provide drawings which show the turbine lube oil subsystem and all of its components and identify those components considered to be within the scope of license renewal and subject to an AMR.

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded by providing a schematic diagram of the turbine lube oil subsystem showing all of its components. The diagram identified additional components which are subject to an AMR and were not previously included in LRA Table 2.3.4.4; the applicant revised the table accordingly. These components include sight glasses and tanks (auxiliary oil reservoir). The applicant also made corresponding revisions to LRA Table 3.4.2-4.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.4-1 acceptable because, with the addition of the above-mentioned components to LRA Table 2.3.4.4, it identifies all components within the scope of license renewal, in accordance with 10 CFR 54.4, and subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.4.4-1 resolved.

RAI 2.0-2F (D-RAI 2.3.4.4-2)

The license renewal boundary drawing D-175016 Unit 1 and Unit 2 standard P&ID legend, and boundary drawings D-175007L and D-205007L show the symbol for startup strainer temporary within the scope of license renewal. Strainers are passive, long-lived components and are not listed in LRA Table 2.3.4.4 as component types subject to an AMR.

The staff requested that the applicant justify the exclusion of the startup strainer temporary from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Applicant's Response and Staff's Evaluation

By letter dated April 7, 2004, the applicant responded that these strainers were removed after initial system startup and are no longer in use. Pipe spool pieces have replaced the strainers and are included in the component type “piping” in LRA Table 2.3.4.4.

Based on its review, the staff finds the applicant's response to RAI 2.0-2F acceptable because it adequately justifies the exclusion of the startup strainer temporary from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers its concern described in RAI 2.0-2F resolved.

As part of its review of the implementation of the applicant’s methodology, as described in the LRA Section 2.1, the NRC inspectors completed a license renewal scoping and screening inspection on May 14, 2004, which is documented in Inspection Report 50-348/2004-007, 50-364/2004-007, dated June 22, 2004. The inspection consisted of a selected examination of procedures and representative records and interviews with personnel regarding the process of scoping and screening plant components to select components subject to an AMR. Additionally, the NRC inspectors performed a walkdown of selected areas of the plant containing SSCs that are considered to be within the scope of license renewal because they meet the 10 CFR 54.4(a)(2) requirement. For a sample of plant systems, specifically those that the NRC reviewers identified, the NRC inspectors performed visual examination of accessible portions of the systems to observe any effects of component aging.

The inspectors concluded that the applicant had successfully performed scoping and screening and identified the SCs subject to aging management, in accordance with the methodology described in the LRA and the Rule, with the following exception.

The inspectors noted that boundary drawings were inconsistent on various drawings in depicting the atmospheric vents for the refueling water storage, condensate storage, and the RMWS tanks as in or out of the scope of license renewal.

By letter dated July 9, 2004, the applicant provided supplemental information on the atmospheric vents on the RWSTs, CSTs, and RMWS tanks. In this supplement, the applicant agreed to include these vents in the scope of license renewal. The applicant stated that these ventlines are considered as an integral subpart of the tanks and, consequently, are lumped into the existing “tank” component type. Therefore, the component types in the AMR tables in the corresponding LRA scoping sections are unaffected. However, the applicant stated that the AMR summary tables should have included additional material-environment combinations for the tanks as a result of bringing the tank vents into scope and provided the additions to the corresponding AMR summary tables.

2.3.4.4.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. In addition, the staff performed an independent assessment to determine whether the applicant omitted any components that should be subject to an AMR. The staff identified no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the AFW system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the AFW system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.5 Auxiliary Steam and Condensate Recovery System

2.3.4.5.1 Summary of Technical Information in the Application

In Section 2.3.4.5 of the LRA, the applicant described the auxiliary steam and condensate recovery LRA system. This system supplies steam for various heating and system loads in the auxiliary and turbine buildings and provides a method of collecting and pumping the condensate from those steam loads back to the turbine building. Steam is drawn from the main steam system. The original plant design included an auxiliary steam generator to supply steam when neither unit could supply steam, but this generator is no longer operational. In the auxiliary building, steam is supplied for loads such as the recycle evaporator and the plant hot water heat exchanger. Condensate from the auxiliary building is processed via the turbine building drains. The auxiliary steam and condensate recovery system is not safety related.

The auxiliary steam and condensate recovery LRA system is within the scope of license renewal, in accordance with 10 CFR 54.4(a)(2), for spatial interaction with safety-related SSCs and because portions of the system comprise high-energy lines and components.

In Table 2.2-1d of the LRA, the applicant identified the following 10 CFR 54.4(a) criteria it used to determine the auxiliary steam and condensate recovery system components that are within the scope of license renewal:

- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))

In Table 2.3.4.5 of the LRA, the applicant listed the auxiliary steam and condensate system component types that are within the scope of license renewal and subject to an AMR, including valve bodies, piping, pump castings, strainers (shell), closure bolting, and tanks.

2.3.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.5 and FNP FSAR Section 10.2.2. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the auxiliary and condensate recovery system, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant did not omit passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff’s review of LRA Section 2.3.4.5 identified areas in which it needed additional information to complete the evaluation of the applicant’s scoping and screening results. Therefore, by letter dated March 23, 2004, the staff issued RAI 2.4.5-2 and, by letter dated April 1, 2004, the staff issued RAI 2.4.5-4 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff’s RAIs and the applicant’s responses, dated April 7, 2004 and April 29, 2004.

RAI 2.0-2G (D-RAI 2.3.4.5-2)

The FNP FSAR uses the designation “auxiliary steam supply system” and states that Units 1 and 2 share this system. However, the FSAR makes no reference to the “auxiliary steam and condensate recovery system,” a designation used in LRA Section 2.3.4.5.

The staff requested that the applicant clarify whether the two different designations represent the same system. If not, the staff asked the applicant to describe how the systems differ. Additionally, the staff requested the applicant to provide license renewal boundary drawings which show the shared components and identify those components considered to be within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a).

Applicant’s Response and Staff’s Evaluation

By letter dated April 7, 2004, the applicant responded that the “auxiliary steam supply system” listed in FSAR Section 1.2.2 is the same as the “auxiliary steam and condensate recovery system” described in LRA Section 2.3.4.5. However, the “auxiliary steam supply system” listed in the FNP FSAR is not the same as the “auxiliary steam system” described in LRA Section 2.3.4.1. The latter system consists of the supply lines from the main steamlines to the AFW pump turbine and is included as part of the main steam system. License renewal boundary drawings D-175033L (Unit 1) and D-205033L (Unit 2) show these lines.

Additionally, the applicant identified the components of the auxiliary steam and condensate recovery system shared by Units 1 and 2 as the auxiliary steam generator, steam supply piping connecting the auxiliary steam generator to the Unit 1 auxiliary steam distribution piping, and condensate return piping from each unit to the auxiliary steam generator. The applicant also stated that the auxiliary steam generator is no longer operational so that the shared components perform no license renewal intended function. Therefore, all shared components located in the turbine building, are excluded from the scope of license renewal because they do not perform any intended function, as described in the requirements of 10 CFR 54.4(a).

Based on its review, the staff finds the applicant’s response to RAI 2.0-2G acceptable because it satisfactorily explains the differences in system nomenclature used in the LRA and the FSAR and clarifies that the auxiliary feed and condensate recovery system components shared by Units 1 and 2 do not perform any license renewal intended function; as such, they are excluded from the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). Therefore, the staff considers the concerns described in RAI 2.0-2G resolved.

RAI 2.3.4.5-4

Table 2.3.4.5 of the LRA lists “strainers (shell)” as a component type subject to an AMR. However, the license renewal boundary drawings D-175033L and D-205033L for the auxiliary steam and condensate system do not show any strainers (shell) within the scope of license renewal. Therefore, the staff is concerned that other drawings which the LRA does not reference may include components of the system that should be included within the scope of license renewal.

The staff requested that the applicant provide drawings that identify the strainers in the auxiliary steam and condensate system that are within the scope of license renewal and subject to an

AMR, in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

Applicant’s Response and Staff’s Evaluation

By letter dated April 29, 2004, the applicant responded that the non-safety-related auxiliary steam and condensate recovery system is solely within the scope of license renewal under 10 CFR 54.4(a)(2) for spatial interaction consideration with safety-related SSCs, including high-energy piping considerations, as stated in LRA Section 2.3.4.5. The “strainers (shell)” component type listed in LRA Table 2.3.4.5 represents strainers, which are located between the auxiliary steam condensate tank and the auxiliary steam condensate pumps. The strainers have a potential spatial interaction with nearby safety-related electrical components in Rooms 189 and 2189, and license renewal boundary drawing D-506447L identifies the spatial interaction concern in these rooms for this system.

As part of its review of the implementation of the applicant’s methodology, as described in the LRA Section 2.1, the NRC inspectors completed a license renewal scoping and screening inspection on May 14, 2004. The inspection consisted of a selected examination of procedures and representative records and interviews with personnel regarding the process of scoping and screening plant components to select components subject to an AMR. Additionally, the NRC inspectors performed a walkdown of selected areas of the plant containing SSCs that are considered to be within the scope of license renewal because they meet the 10 CFR 54.4(a)(2) requirement. For a sample of plant systems, specifically those that the NRC reviewers identified, the NRC inspectors performed visual inspection of accessible portions of the systems to observe any effects of component aging.

As part of its consideration of the applicant’s response to RAI 2.3.4.5-4, the staff could not determine which specific components were within the scope of license renewal, according to 10 CFR 54.4(a)(2), and subject to an AMR. Therefore, the staff requested that the inspection team verify that LRA Table 2.3.4.5 includes the component types and intended functions for the non-safety-related components in the listed rooms. As documented in Inspection Report 50-348/2004-007, 50-364/2004-007, dated June 22, 2004, the inspectors reviewed the system scoping and screening documents, design-basis information, applicable FSAR sections, and boundary drawings and concluded that the applicant’s identification of in-scope components, in accordance with the requirements of 10 CFR 54.4(a)(2), was consistent with the application of the license renewal rule.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.5-4 acceptable because it adequately explains that the strainers in the auxiliary steam and condensate recovery system are within the scope of license renewal under 10 CFR 54.4(a)(2) for spatial interaction consideration with safety-related SSCs. In addition, the NRC inspectors reviewed the system scoping and screening system documents and concluded that the applicant’s identification of in-scope components, in accordance with the requirements of 10 CFR 54.4(a)(2), was consistent with the application of the license renewal rule. Therefore, the staff considers the concerns described in RAI 2.3.4.5-4 resolved.

2.3.4.5.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the auxiliary steam and condensate recovery system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the auxiliary steam and condensate recovery system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.6 Turbine and Turbine Auxiliaries

The turbine and turbine auxiliaries LRA system comprises the main turbine and certain auxiliary equipment.

2.3.4.6.1 Summary of Technical Information in the Application

In Section 2.3.4.6 of the LRA, the applicant described the turbine and turbine auxiliaries LRA system. The main steam turbine, which draws steam from the main steam system, drives the main generator to produce the plant electrical output. The turbine control system, which includes the digital electrohydraulic (EH) control subsystem, is integral to the operation of the turbine. The turbine auxiliaries include the moisture separator reheaters (MSRs), extraction and reheat steam components, gland sealing steam components, and the turning gear for rolling the turbine at very low speeds when steam is unavailable. The turbine lube oil system, which includes the both the lubricating oil and auto-stop oil subsystems, is also included.

Four parallel flowpaths supply steam to the high-pressure turbine, where each path is equipped with a throttle valve and a governor valve. Steam exiting the high-pressure turbine is passed through the MSRs, where reheating and moisture removal takes place before the steam enters the two low-pressure turbines via four parallel paths. Each of these paths is equipped with a reheat stop valve and a reheat intercept valve.

The turbine control system positions the steam valves controlling steamflow to the high-pressure and low-pressure turbines (i.e., high-pressure throttle and governor valves, and reheat stop and intercept valves). The EH subsystem operates to meet the fluid pressure demands for positioning these steam valves. The turbine lube oil system provides pressurized oil to the auto-stop oil header, in addition to providing lubrication for the turbine. Dumping the auto-stop oil header pressure or the EH fluid pressure to the actuators will close the steam valves (tripping the turbine).

The non-safety-related SCs of the turbine and turbine auxiliaries that are required to trip the turbine in response to an ATWS event and in response to a turbine overspeed event are conservatively included in the scope of license renewal. The turbine overspeed trip reliability is an input to the turbine missile probability analysis that demonstrates the adequacy of the plant design. Therefore, the scope of license renewal conservatively includes the SCs that perform this function, in accordance with 10 CFR 54.4(a)(2).

In Table 2.2-1d of the LRA, the applicant identified the following 10 CR 54.4(a) criteria it used to determine the turbine and turbine auxiliaries LRA system components that are within the scope of license renewal:

- non-safety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- anticipated transient without scram (10 CFR 54.4(a)(3))

In LRA Section 2.3.4.6, the applicant stated that there are no mechanical components of the turbine and turbine auxiliaries that are subject to an AMR.

2.3.4.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.6 and FNP FSAR Sections 10.1, 10.2, 10.4.3 and 7.8. The staff conducted its review, using the evaluation methodology described in Section 2.3 of this SER, in accordance with the guidance described in Section 2.3 of NUREG-1800.

In its evaluation, the staff used the scoping process described in Section 2.3 of this SER to review the FSAR to determine if the applicant identified all system functions in the LRA as an intended function of the turbine and turbine auxiliaries, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then reviewed the FSAR, in accordance with the screening process described in Section 2.3 of this SER, to verify that the applicant included all passive and long-lived components from an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.4.6 identified an area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated April 1, 2004, the staff issued an RAI to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI and the applicant's response, dated April 29, 2004.

<u>RAI 2.3.4.6-1</u>

Section 2.3.4.6 of the LRA states that, in accordance with 10 CFR 54.4(a)(3), "The non-safety-related SCs of the turbine and turbine auxiliaries that are required to trip the turbine in response to an ATWS event and in response to a turbine overspeed event are conservatively included within the scope of license renewal for FNP." However, LRA Section 2.3.4.6 also states that no mechanical components of the turbine and turbine auxiliaries are identified as subject to an AMR.

Since LRA Section 2.3.4.6 does not provide or reference any license renewal boundary drawings associated with the turbine and turbine auxiliaries, the staff could not confirm that the turbine and turbine auxiliaries do not contain mechanical components subject to an AMR. To complete its review, the staff requested that the applicant provide a description or license renewal boundary drawing that identifies the components of the turbine and turbine auxiliaries and that shows which SCs are considered to be within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a). The staff also requested that the applicant justify the exclusion of the mechanical components of the turbine and turbine auxiliaries from an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

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

By letter dated April 29, 2004, the applicant provided a detailed discussion of the turbine trip functions associated with this system, supplemented with schematic diagrams. The applicant stated that active components perform trip functions, and any failure of a passive component, in particular the loss of pressure boundary, would not prevent the system from performing its intended function (turbine trip in response to an ATWS event or turbine overspeed event). A loss of pressure boundary in either the EH fluid subsystem or the auto-stop oil subsystem would automatically initiate a turbine trip rather than prevent one. Since the passive components of the turbine trip system have no license renewal intended functions, the applicant concluded that no mechanical components are subject to an AMR.

As part of its review of the implementation of the applicant methodology, as described in the LRA Section 2.1, the NRC inspectors completed a license renewal scoping and screening inspection on May 14, 2004. The inspection consisted of a selected examination of procedures and representative records and interviews with personnel regarding the process of scoping and screening plant components to select components subject to an AMR. The NRC inspectors also performed a walkdown of selected areas of the plant containing SSCs that are considered to be within the scope of license renewal because they meet the10 CFR 54.4(a)(2) requirement. For a sample of plant systems, specifically those that the NRC reviewers identified, the NRC inspectors performed a visual examination of accessible portions of the systems to observe any effects of component aging.

As part of its consideration of the applicant’s response to RAI 2.3.4.6-1, the staff requested that the inspection team confirm that the turbine and turbine auxiliaries components required for the license renewal function included no passive components requiring an AMR. As documented in Inspection Report 50-348/2004-007, 50-364/2004-007, dated June 22, 2004, the inspectors reviewed the applicant’s RAI response and the schematics for the EH systems and the turbine lube oil system and reviewed the accessible components in the field. The inspectors identified no passive components subjected to license renewal scope.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.6-1 acceptable because it satisfactorily demonstrates that only active components perform the turbine trip function and that the passive components have no license renewal intended functions, and the inspection report verifies that no mechanical component of the turbine trip system is subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). Therefore, the staff considers RAI 2.3.4.6-1 resolved.

2.3.4.6.3 Conclusion

The staff reviewed the LRA and the accompanying scoping boundary drawings to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the turbine and turbine auxiliaries system that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the turbine and turbine auxiliaries system that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

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

This SER section documents the staff's review of the results of the applicant's scoping and screening results for containments, structures, and component supports. This section reviews the following structures and structural components:

- containment structure
- other structures
- component supports

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must identify and list passive, long-lived structures and structural components that are 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 the applicant omitted no structures and structural components that meet the scoping criteria and are subject to an AMR.

Staff Evaluation Methodology

The staff performed its evaluation of the information provided in the LRA in the same manner for all SCs. The review determined if the applicant identified all the components and supporting structures for a specific containment, structure, or containment support that appeared to meet the scoping criteria specified in the Rule 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-live, passive components were subject to an AMR in accordance with 10 CFR 54.21(a)(1).

Scoping. To perform its evaluation, the staff reviewed the applicable LRA section and associated component drawings, focusing on components that the applicant had not identified as within the scope of renewal. The staff reviewed relevant licensing basis documents, including the FSAR, for each structure or structural component to determine if the applicant had omitted system components with intended functions delineated under 10 CFR 54.4(a) from the scope of license renewal. The staff also reviewed the licensing basis documents to determine if the applicant specified all intended functions delineated under 10 CFR 54.4(a) in the LRA. If it identified omissions, the staff requested additional information to resolve the discrepancy.

Screening. Once the staff completed 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 if the functions are performed with moving parts or a change in configuration or properties, or 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 structures and structural components were subject to an AMR, as required by 10 CFR 54.21(a)(1). If it identified discrepancies, the staff requested additional information to resolve them.

2.4.0 Staff Evaluation

According to 10 CFR 54.21(a)(1), the applicant must identify and list SCs subject to an AMR. These are passive, long-lived SCs that are within the scope of license renewal. To verify that the applicant has properly implemented its methodology, the staff focuses its review on the implementation results. Such a focus allows the staff to confirm that the applicant omitted no structural components that are subject to an AMR. If the review identifies no omission, the staff has the basis to find that the applicant identified the structural components that are subject to an AMR.

This SER section addresses the applicant's scoping and screening results for structures. Table 2.2-1e identified the following structures as within the scope of license renewal:

- containment structure (LRA Section 2.4.1)
- auxiliary building (LRA Section 2.4.2.1)
- diesel generator building (LRA Section 2.4.2.2)
- turbine building (LRA Section 2.4.2.3)
- utility/piping tunnels (LRA Section 2.4.2.4)
- water control structures (LRA Section 2.4.2.5)
- steel tank structures (foundations and retaining walls) (LRA Section 2.4.2.6)
- yard structures (LRA Section 2.4.2.7)
- component supports (LRA Section 2.4.3)

Table 2.2-1h of the LRA identifies structures that are not within the scope of license renewal. The staff's review of LRA Table 2.2-1h identified several areas in which it needed additional information to complete the evaluation of the applicant's scoping results. Therefore, by letter dated February 13, 2004, the staff issued RAI 2.4-1 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a). The following describes the staff's RAI:

> LRA Table 2.2-1h identifies structures that are not within the scope of license renewal. It is not obvious to the staff that all of the listed structures serve no intended function. The applicant is requested to provide its technical basis for this determination for the following structures: circulating water structures and cooling towers; containment equipment hatch access enclosure; river water intake structure; meteorological & microwave structures and equipment; and yard drainage system. Also verify that seismic II/I considerations are not applicable to any of the structures not in the scope of license renewal (e.g., containment equipment hatch access enclosure).

In addition, while the staff acknowledges that the tendon access gallery does not serve an intended function in the strictest interpretation of the license renewal rule, significant industry operating experience relates to flooding and corrosive environments in the tendon access gallery that have contributed to degradation of the tendon anchorage components and surrounding concrete. Management of the condition of the tendon access gallery is a preventive step to minimize aging effects for the prestressing system. The staff asked the applicant to submit its plant-specific operating/aging experience related to (1) flooding and corrosive environments in the tendon access gallery, and (2) degradation of the prestressing system components (both steel and concrete) in the tendon access gallery, and, based on the FNP-specific tendon gallery operating/aging experience, to discuss FNP's basis for excluding the tendon gallery structure from an AMR, pursuant to 10 CFR 54.4(a)(2).

In its response to RAI 2.4-1, dated March 12, 2004, the applicant stated the following:

> SNC has verified for the structures listed in Table 2.2-1h "Systems and Structures Not Within the Scope of License Renewal—Structures," that seismic II/I considerations are not applicable.

The staff requested the technical basis for determining the following structures are not in the scope of license renewal: circulating water structures and cooling towers, containment equipment hatch access enclosure, river water intake structure, meteorological and microwave structures and equipment, and yard drainage system. These structures do not house equipment relied upon in the licensing basis to perform safe shutdown, mitigate accidents, or address any of the regulated events in the scope of the Rule. The structures cannot fail in a way that adversely affects a safety-related function or the performance of safety-related equipment. Therefore, these structures do not satisfy the criteria as defined in 10 CFR 54.4(a)(1–3) and are not within the scope of license renewal. The applicant provided the following discussion for each structure:

> Circulating Water Structures and Cooling Towers: The circulating water systems and structures, including the cooling towers, provide cooling water to the tube-side of the main condensers for removal of waste heat from the power cycle (including maintaining condenser vacuum in support of efficient turbine operation). During a normal plant shutdown heat is rejected to the main condenser via the non safety-related main steam dump valves, however this method is not credited for safe shutdown. The main steam safety valves and main steam atmospheric relief valves, which discharge directly to the atmosphere, provide the safety-related means for decay heat removal to maintain hot shutdown. The circulating water structures include the concrete basins under the cooling towers, concrete canals and tunnels that direct the water flow to and from the condensers, and the circulating water pump structures. The cooling towers are not located near any safety-related SSCs, and the circulating water structures cannot fail in any way that could interact with a safety related structure.
>
> Containment Equipment Hatch Access Enclosure: This non safety-related enclosure is a free-standing sheet metal and steel frame structure that provides shelter over the equipment hatch access area from inclement weather during outage activities. The enclosure is open on two sides to provide free access to the Containment Equipment Hatch. The structure is of lightweight construction such that failure of the structure (e.g., during a seismic event) will not impair the ability of the containment structure (including equipment hatch) from performing its intended function.
>
> River Water Intake Structure: Loss of the River Water Intake Structure is discussed in UFSAR Section 9.2.1.2.3.1 which states "The station cooling water system is designed such that safe shutdown of the plant is not dependent on the river water system as a cooling water source" and "The storage pond alone serves as the ultimate heat sink for the plant." The River Water Intake Structure is located remote from the plant's safety-related structures (over 2000 feet from the Auxiliary Buildings and from the pond) and houses the river water pumps and related equipment, none of which are required for safe shutdown (including in the event of a fire) or to mitigate any accident. The portions of the River Water System within the scope of License Renewal (i.e., the Service Water pond level instruments) described in LRA Section 2.3.3.5 are located at the pond and not at or in proximity of the River Water Intake Structure.
>
> Meteorological & Microwave Structures: Instruments for measuring meteorological parameters are installed on a main and a backup tower located in a cleared area north of the plant site. Microwave communication equipment is also installed on these towers. The towers and equipment are non safety-related and do not pose any spatial interaction hazard to safety-related SSCs based on the remote location. In addition, the intended functions of these SSCs do not meet the 10 CFR 54.4(a) criteria for safety-related or regulated events. Some of the meteorological data is utilized for post-accident release assessment (R.G. 1.97 Category 3 variable) but is not safety-related (it does not mitigate, only assesses the consequences of an accident). The microwave communication is connected to the intra plant telephone switchboard to enable plant personnel to have dial service to other Alabama Power Company locations. The meteorological and microwave communication systems are not required in the licensing basis to safely shutdown the plant or mitigate an accident.
>
> Yard Drainage System: The yard drainage system is a combined system of culverts and open ditches that direct water (from rainfall) to natural drainage channels. The power block area, which is located on a small plateau, utilizes the elevation difference and resultant topography to direct rainfall runoff away from the facility. The yard drainage system assists in directing the rainfall runoff however the probable maximum

precipitation (PMP) evaluation assumed all of the buried storm drainage system was inoperative and the PMP runoff was carried off on the ground (refer to FSAR section 2.4.10). The PMP evaluation demonstrated no flooding of a doorway or opening of a safety-related building would occur from the runoff, and therefore an operating storm drainage system is an added safeguard but is not relied upon in the licensing basis for FNP.

Tendon Access Gallery

The following describes the requested FNP plant-specific operating/aging experience related to the tendon access gallery:

- flooding and corrosive environments in the tendon access gallery

  A review of experience at FNP has identified ground water intrusion into the containment tendon access gallery. The ground water intrudes through construction joints between the nonsafety-related tendon access gallery wall and the containment foundation. A sump pump system is located in the tendon access gallery to pump out the water from the gallery. A few inches of water accumulation has been identified at some areas in the gallery during inspections.

  In summary, the FNP tendon access gallery is a high-humidity environment with water accumulation controlled by the installed sump pump system.

- degradation of prestressing components

  The applicant has not observed any noticeable degradation of the prestressing system components (both steel and concrete) in the tendon access gallery. Canned enclosures filled with grease protect the prestressing system steel components that are exposed (not in the concrete) to the tendon access gallery environment. The condition of these cans is checked as part of the containment inspections.

  The applicant has observed some minor concrete leaching in the containment access gallery. Leaching has been identified (along with ground water intrusion) at the interface joint between the gallery and the bottom of the containment foundation. The leaching material from the interface joint is considered insignificant in causing any deterioration (the ground water at FNP is nonaggressive) and, therefore, does not result in any loss of function.

As its basis for not including the tendon gallery structure within the AMR scope, pursuant to 10 CFR 54.4(a)(2), SNC agrees with the following excerpt from NUREG-1800, which asserts that the tendon access gallery does not perform an intended function, and that containment inspections (i.e., IWL inspections) “provide reasonable assurance that the aging effects of the tendon anchorages, including those in the gallery, will continue to perform their intended functions”:

> The intended function of the post-tensioning system is to impose compressive forces on the concrete containment structure to resist the internal pressure resulting from a DBA with no loss of structural integrity. Although the tendon gallery is not relied on to maintain containment integrity during DBEs, operating experience indicates that water infiltration and high humidity in the tendon gallery can contribute to a significant aging

> effect on the vertical tendon anchorages that could potentially result in loss of the ability of the post-tensioning system to perform its intended function. However, containment inspections provide reasonable assurance that the aging effects of the tendon anchorages, including those in the gallery, will continue to perform their intended functions. Because the tendon gallery itself does not perform an intended function, it is not within the scope of license renewal.

Because of the conditions which exist in the tendon access gallery, the applicant has identified this area for inspections during future outages to ensure that the gallery does not degrade to an unacceptable structural condition. However, the applicant did not credit these inspections for license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.4-1 acceptable because it clearly describes the technical bases for determining that the circulating water structures and cooling towers, containment equipment hatch access enclosure, river water intake structure, meteorological and microwave structures and equipment, and yard drainage system are not within the scope of license renewal. The applicant has also verified that seismic Category II/I considerations do not apply to any of the structures listed in LRA Table 2.2-1h.

In addition, the applicant described its plant-specific operating/aging experience for the tendon access gallery, including water intrusion through construction joints and the use of a sump pump system in the gallery. To date, there has been no significant degradation of prestressing system components. The applicant has identified the tendon access gallery for inspections during future outages, to ensure that the gallery does not degrade to an unacceptable structural condition; however, the applicant did not credit these inspections for license renewal. The applicant quoted from NUREG-1800, which states, "Because the tendon gallery itself does not perform an intended function, it is not within the scope of license renewal."

Therefore, the staff considers its concern described in RAI 2.4-1 resolved.

Load handling systems have components that are both mechanical and structural in nature. The structural components are passive and long-lived. If a specific load handling system serves an intended function, then it is subject to an AMR. The staff identified the need for additional information about the applicant's scoping, screening, and AMR results for load handling systems in order to complete its review. Therefore, by letter dated February 13, 2004, the staff issued RAI 2.4-3 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI:

> Please clarify the complete scope of load handling systems in the Farley LR scope. LRA Section 2.3.3.4 "Overhead Heavy and Refueling Load Handling System" appears to be limited to the major heavy lift and refueling-related systems. Are there any other load handling systems that serve an intended function (e.g., seismic II/I), and are included in the LR scope? If so, please provide a description of the other load handling systems in the LR scope; define their intended functions; identify whether they are in the Mechanical Systems scope or Structures scope; and specify where the AMR is located in the LRA.

In its response to RAI 2.4-3, dated March 12, 2004, the applicant stated the following:

> Section 2.3.3.4 “Overhead Heavy and Refueling Load Handling System” is limited to the major heavy lift and the refueling-related load handling systems. Included in the scope of license renewal for this LRA system are the containment polar cranes, reactor cavity manipulator cranes, spent fuel bridge cranes, and the spent fuel cask crane. The new fuel load handling systems are non safety-related and not in scope. Based on the observations made during field walkdowns, failure of the new fuel load handling systems could not prevent satisfactory accomplishment of any safety related function (spatial interaction). Therefore, the new fuel load handling systems were not brought into the scope of license renewal as part of the evaluation for the “Overhead Heavy and Refueling Load Handling System.”
>
> All load handling systems (e.g., monorails, jib crane, new fuel load handling systems) used in Category I structures were put in scope as part of the scoping of the associated structure in Section 2.4 of the LRA. The “spaces approach” used to scope the civil/structural components in these structures ensures all load handling systems that serve an intended function (e.g., seismic II/I) were included in the scope of license renewal.
>
> These components are in structural scope (Section 2.4 of the LRA) and their intended function is Structural Support. The Component Type “Steel Components: All Structural Steel” for each building covers the passive long-lived components for these items (e.g., AMR Tables 3.5.2-2, 3.5.2-3, etc.). The Structural Monitoring Program is credited for aging management of these passive long-lived components.

Based on its review, the staff finds the applicant’s response to RAI 2.4-3 acceptable because the applicant has clearly described the load handling systems that are within the scope of license renewal and has provided an acceptable technical basis for excluding the new fuel load handling systems from the license renewal scope. Section 2.3.3.4, “Overhead Heavy and Refueling Load Handling System,” of the LRA includes the containment polar cranes, reactor cavity manipulator cranes, spent fuel bridge cranes, and the spent fuel cask crane under mechanical systems scoping and screening. The applicant reviewed all other load handling systems in Category I structures using a spaces approach. Section 2.4 of the LRA includes the load handling systems that serve an intended function (e.g., seismic Category II/I) under structures scoping and screening as structural components of the Category I structures in which they are located. The components are all structural steel components, and the Structural Monitoring Program is credited for their aging management. Therefore, the staff considers its concern described in RAI 2.4-3 resolved.

2.4.1 Containment Structures

2.4.1.1 Summary of Technical Information in the Application

In Section 2.4.1 of the LRA, the applicant described the containment as a Class 1 structure that completely encloses the reactor, the RCS, the steam generators, and portions of the auxiliary and ESF systems. The structure provides protection for these features from external events (e.g., tornado) and functions as a fission product barrier following an accident inside the containment. It ensures that an acceptable upper limit for leakage of radioactive materials to the environment will not be exceeded even if gross failure of the RCS occurs. The structure also provides biological shielding during normal operation and following a LOCA. In addition, the containment structure includes components required for reactor refueling, including the polar crane, refueling cavity, and portions of the fuel handling system.

The containment internal structures comprise concrete and steel components. The major concrete internal components include the reactor cavity, primary shield wall, secondary shield wall, refueling canal, and floor slabs. The major steel internal components include the RCS supports, refueling canal liner, steel framing, miscellaneous platforms, pipe whip restraints, and supports for cable trays, conduits, ventilation ducting, piping, and other components.

The applicant used a spaces approach for scoping and screening of the structures and structural components located inside the containment structure. Support elements located in the containment building, such as pipe supports, electrical raceways and their supports, HVAC supports, and miscellaneous platforms, are in the scope of license renewal regardless of safety designation or design classification.

The discussions of the major elements of the containment structure fall under the following headings:

- structure and foundation
- steel liner plate
- penetrations
- containment internal structures

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the SSCs for the containment structure that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))

In Table 2.4.1 in the LRA, the applicant identified the containment structure components types that are within the scope of license renewal and subject to an AMR, including concrete elements (abovegrade dome, wall, ring girder, buttresses); concrete elements (belowgrade wall, buttresses); concrete elements (foundation, subfoundation); concrete (internal structures); fuel transfer tube; internal structures (steel liners); penetration sleeves and penetration bellows; personnel airlock and equipment hatch; prestressing system (tendons, anchorage components); seals, gaskets, and moisture barriers; steel components (refuel cavity and transfer canal miscellaneous steel); steel elements (liner, liner anchors, integral attachments); sump trash rack; and trisodium phosphate basket.

2.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.1 and the referenced FNP FSAR Sections 3.8, 6C, 6.2.3.4.1, and 9.1.4.2. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the containment structure as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.4.1 identified one area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 2, 2004, the staff issued RAI 2.4-7 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of

10 CFR 54.21(a)(1). The following describes the staff's RAI:

> LRA Section 2.4.1 "Containment Structure" contains the following discussion related to electrical penetrations through containment:
>
> 2.4.1.3 Penetrations
>
> In general, a containment penetration consists of a sleeve embedded in the concrete wall or floor and welded to the containment liner plate. Loads on the penetration are transferred to the containment structure. The process pipe or cable feed-through assembly passes through the sleeve and is seal welded to the sleeve via an appropriate adapter. Additional detail is provided below.
>
> <u>Electrical Penetrations</u>
>
> Electrical penetrations consist of a sleeve that passes through the containment boundary. The sleeve is welded to the containment liner plate. A cable feed-through assembly is inserted in the sleeve and welded to the sleeve inside containment for Conax and GE type penetrations. The feed-through assembly is screwed to the clip angle for a Westinghouse type penetration.
>
> LRA Table 2.2-1f "Systems and Structures within the Scope of License Renewal—Electrical Components" specifically lists "(Electrical) Containment Penetrations." However, LRA Table 2.5.1 "Electrical Component Types Subject to Aging Management Review and their Intended Functions" does not specifically identify the cable feed-through assembly.
>
> LRA Table 2.4.1 "Containment Structure Component Types Subject to Aging Management Review and their Intended Functions" does not identify any component group that would obviously include the cable feed-through assembly.

From the information in the LRA, the staff could not determine whether the applicant is treating the cable feed-through assembly as a component of the containment structure or as an electrical component. The staff asked the applicant to clarify its treatment of the cable feed-through assembly and to identify the location of the AMR in the LRA.

In its response to RAI 2.4-7, dated March 31, 2004, the applicant stated the following:

> For the Farley LRA, the cable feed-through assembly is treated as an electrical component with the electrical connection function addressed in the electrical scoping and screening evaluations. However, the pressure-boundary and fission product barrier function of the assembly is included in the civil/structural scoping and screening for the containment structure.
>
> The last paragraph of the system description subsection of LRA Section 2.3.2.2, "Containment Isolation System" outlines the division of responsibility for containment penetration assemblies between the various disciplines (mechanical, electrical, and civil), however some minor clarifications are needed. This paragraph should read as follows (changes are identified by bold italics and strikeouts):
>
> Note that the pressure boundary ~~***(metallic)***~~ portions of electrical penetrations, pipe sleeve assembly surrounding process penetrations, and miscellaneous/spare mechanical penetrations that are not

> associated with a process system are included in the civil/structural screening described in Section 2.4 of this application. The ~~non-metallic and~~ conductor portions ***(e.g., electrical cables and connections)*** of electrical penetrations are included in the electrical/I&C screening described in Section 2.5 of this application.

Pressure-Boundary and Fission Product Barrier Function

Tables 2.4.1 and 3.5.2-1 of the LRA list component types "penetration sleeves, penetration bellows" and "seals, gaskets, and moisture barriers." The component type "penetration sleeves, penetration bellows" includes the cable feed-through assemblies for electrical penetrations and the closure assemblies for the miscellaneous/spare mechanical penetrations. The component type "seals, gaskets, and moisture barriers" includes the sealants and gaskets used in these electrical and mechanical penetration assemblies.

The LRA should have included pressure boundary as an intended function for the "seals, gaskets, and moisture barriers" component type (for consistency).

Electrical Connection Function

The FNP has both EQ and non-EQ containment electrical penetrations. The cable feed-through assemblies for electrical penetrations that are subject to 10 CFR 50.49 EQ requirements are treated as TLAAs and addressed in Section 4.4 of the LRA (refer to Table 3.6.1, item 3.6.1-1). The first two component types in LRA Tables 2.5.1 and 3.6.2-1 include the cable feed-through assemblies for non-EQ containment electrical penetrations:

- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
- electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance

Based on its review, the staff finds the applicant's response to RAI 2.4-7 acceptable because it clarifies the applicant's evaluation of the cable feed-through assembly for containment electrical penetrations. The civil/structural scoping and screening for the containment structure includes the pressure-boundary and fission product barrier function of the assembly. The component types "penetration sleeves, penetration bellows" in LRA Tables 2.4.1 and 3.5.2-1 include the cable feed-through assemblies for electrical penetrations. The component type "seals, gaskets, and moisture barriers" in LRA Tables 2.4.1 and 3.5.2-1 include the sealants and gaskets used in these electrical assemblies. The applicant also noted that the LRA should have included pressure boundary as an intended function for the "seals, gaskets, and moisture barriers" component type.

Therefore, the staff considers its concern described in RAI 2.4-7 resolved.

The staff's review of the LRA Section 2.4.1 identified a second area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated April 12, 2004, the staff issued RAI 2.4-8 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI:

> The staff requires additional information concerning the possibility that thermal insulation

may serve an intended function, in accordance with 10 CFR 54.4(a)(2), to control the maximum temperature of safety-related structures and structural components that meet 10 CFR 54.4(a)(1). Possible examples are (1) maintaining the maximum temperature of steel and/or concrete elements of NSSS supports below the levels assumed in the design basis of the supports; and (2) maintaining the maximum temperature of structural concrete below the threshold levels of 150 °F for general areas and 200 °F for local areas around hot penetrations.

Thermal insulation is typically passive and long-lived. If it also serves an intended function in accordance with 10 CFR 54.4(a)(2), then it meets the criteria for inclusion within the scope of license renewal. Consequently, the applicant was requested to (1) identify any thermal insulation at Farley that serves an intended function in accordance with 10 CFR 54.4(a)(2); (2) describe plant-specific operating experience related to degradation of (a) thermal insulation in general, and (b) thermal insulation that serves an intended function in accordance with 10 CFR 54.4(a)(2); and (3) describe the scoping and screening evaluation for thermal insulation that serves an intended function in accordance with 10 CFR 54.4(a)(2), including the technical basis for either inclusion within or exclusion from the scope of license renewal.

The following provides the applicant's response to RAI 2.4-8, dated May 10, 2004:

SNC brought thermal insulation into the scope of license renewal when the insulation served an intended function as defined in 10 CFR 54.4(a). Examples of thermal insulation that have been considered to be within the scope of license renewal are cable fire wrap (Reference: SNC responses to RAI 2.3.3.13-2 and RAI 2.3.3.13-3) and CO_2 tank insulation (Reference: FNP LRA Table 2.3.3-13). In a telephone conversation held on April 30, 2004, the NRC clarified that the scope of this question is limited to insulation to control the maximum temperature of safety-related structural elements.

The subject thermal insulation at FNP is not in scope under the provisions of 10 CFR 54.4(a)(1). Thermal insulation is not relied upon in FNP's current licensing basis (CLB) to perform any safety related function. Specifically, the thermal insulation at FNP does not serve a safety-related function to limit the temperature of structural steel and/or concrete elements, including the supports for the NSSS components. Thermal insulation is neither installed on the containment liner nor installed in any of the hot pipe penetrations. During normal operations, area and room temperature monitoring activities assure environmental temperatures are maintained within established limits. Environmental control systems that maintain temperatures during power operations and are not relied upon for safe shutdown or accident mitigation (e.g., reactor cavity cooling, containment air recirculation system, etc.) are non safety-related in FNP's CLB.

The subject thermal insulation at FNP is also not in scope under the provisions of 10 CFR 54.4(a)(2). SNC followed the guidance provided by the Commission and the staff in determining the non safety-related systems, structures, and components (SSCs) whose failure could prevent satisfactory accomplishment of a safety function. The Rule's Statement of Considerations (SOC) in Section III.c(iii), "Bounding the Scope of Review," provides the following guidance to assist an applicant in determining the extent to which failures must be considered when applying the scoping criterion:

"Consideration of hypothetical failures that could result from system interdependencies that are not part of the CLB and that have not been previously experienced is not required. […] However, for license renewal applicants, the Commission cannot exclude the possibility that hypothetical failures that are part of the CLB may require consideration of second-, third- or fourth-level support systems."

NUREG-1800 reiterates and expands on the 10 CFR 54.4(a)(2) scoping guidance provided in the Rule's Statement of Considerations (SOC). NUREG-1800 section 2.1.3.1.2 states:

"… the applicant should consider those failures identified in (1) the documentation that makes up its CLB, (2) plant-specific operating experience, and (3) industry-wide operating experience that is specifically applicable

> to its facility. The applicant need not consider hypothetical failures that are not part of the CLB, have not been previously experienced, or are not applicable to its facility."
>
> The failure of thermal insulation during a design basis accident in containment (e.g., from damage due to jet impingement) is evaluated and determined not to cause clogging/blockage of the containment emergency sumps in the FNP CLB. No other failures of thermal insulation are identified in the CLB.
>
> Thermal insulation is not identified in the FNP CLB as a supporting feature for structural SSCs that perform safety-related functions. The SNC position that the insulating property of insulation is not within the scope of the Rule concurs with prior applicants, most recently V.C. Summer Nuclear Station (refer to response to NRC RAI S AMR-1 in Attachment 1 of VCSNS response dated September 24, 2003).
>
> In addition, SNC has conducted a review of FNP-specific and industry-wide operating experience associated with insulation. The review has determined that FNP has not experienced degradation of insulation impacting structural temperatures. Minor damage to insulation has occurred at FNP, due most often to mishandling, improper installation, and other human performance errors. A review of industry operating experience resulted in similar findings for insulation types used at FNP. The degradations identified were not aging related. SNC has concluded that there are no plausible aging effects for the subject insulation at FNP that would warrant an aging management program. This determination is consistent with previous applicants and NRC staff determinations (e.g., Safety Evaluation Report for the License Renewal Application for the Calvert Cliffs Nuclear Plant, December 1999, Section 2.2.3.13.2.1). Thus, under 10 CFR 54.4, SNC maintains that insulation will not fail in a manner that could prevent satisfactory accomplishment of any of the safety-related functions identified under 10 CFR 54.4(a)(1), or in a manner that could adversely impact the function of a safety-related SSC.
>
> There has been specific ongoing discussion between the NRC Staff and SNC with regard to insulation used on the reactor coolant system (RCS) components and the impact of the loss of the insulation upon concrete temperatures inside the containment. As stated above, the failure of the insulation is not required to be considered, since that failure is neither considered in the FNP CLB nor identified through operating experience. However, there is additional defense-in-depth beyond the RCS insulation that assures concrete temperature limits are not exceeded. Technical Specification 3.6.5 limits bulk containment temperature to 120 F or below. Various containment fans limit hot spots such that SNC does not expect containment concrete temperature thresholds would ever be exceeded. This position is in agreement with the positions of prior applicants, who have also not included the RCS system insulation within the scope of 10 CFR 54.4(a).
>
> In conclusion, specific applications of thermal insulation at FNP are in scope under the criteria of 10 CFR 54.4(a)(3). Thermal insulation at FNP is not in scope under the provisions of 10 CFR 54.4(a)(1) or 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.4-8 acceptable because the second paragraph of the RAI response provides a sufficient technical basis to conclude that thermal insulation does not serve an intended function to control the maximum temperature of safety-related structural elements. As the applicant indicated in the first paragraph of the RAI response, "In a telephone conversation held on April 30, 2004, the NRC clarified that the scope of this question is limited to insulation to control the maximum temperature of safety-related structural elements."

The staff has not evaluated the remaining paragraphs of the RAI response beyond the second paragraph because they do not relate directly to closure of RAI 2.4-8. Therefore, the finding of acceptability noted above is based upon the first two paragraphs of the RAI response.

The staff considers its concern described in RAI 2.4-8, for the specific intended function of controlling the maximum temperature of safety-related structural elements, to be resolved.

2.4.1.3 Conclusion

During its review of the information in the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the containment SCs. The staff concludes that the applicant has adequately identified the containment SCs that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the containment SCs that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.2 Other Structures

The sections below discuss the following other structures:

- auxiliary building
- diesel generator building
- turbine building
- utility/piping tunnels
- water control structure
- steel tank structures (foundation and retaining walls)
- yard structures

2.4.2.1 Auxiliary Building

2.4.2.1.1 Summary of Technical Information in the Application

In Section 2.4.2.1 of the LRA, the applicant described the auxiliary building.

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the auxiliary building SSCs that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.4.2.1 of the LRA, the applicant identified the auxiliary building component types that are within the scope of license renewal and subject to an AMR, including compressible joints and seals, concrete (exterior abovegrade), concrete (exterior belowgrade), concrete (foundation), concrete (interior), concrete (roof slab), nonfire doors, fire doors, fire seals, masonry walls (all), new fuel storage racks (storage rack assembly), penetration sleeves, spent fuel storage racks (storage racks), steel components (all structural steel), and steel components (liners).

2.4.2.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.1 and the referenced FNP FSAR Sections 2B.6.3, 3.8, and 9.1. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the auxiliary building as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of the LRA Section 2.4.2.1 identified one area in which it needed clarification to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 2, 2004, the staff requested a clarification to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a). The following describes the staff's request for clarification:

> LRA Section 2.4.2.1 states that the Auxiliary Building is a reinforced concrete slab, bearing directly on the Lisbon foundation. However, FSAR Section 3.8.4.1A indicates that portions of the foundation consist of a reinforced concrete slab placed over 9 ft. 5 in. of concrete fill, which in turn bears on the Lisbon formation. FSAR Section 3.8.4.1A further indicates that another portion of the foundation consists of a reinforced concrete slab placed over 30 ft. of compacted fill, which in turn rests on a reinforced concrete mat bearing directly on the Lisbon formation. In addition, FSAR Section 3.8.5.1B indicates that the eastern section of the Auxiliary Building is supported on spread footings which bear on the Lisbon formation, and also states that loads are transmitted through cast-in place reinforced concrete columns. The applicant was requested to clarify whether all the concrete structural elements of the Auxiliary Building foundation (as described in the FSAR) are within the scope of license renewal. If not, provide the technical basis for their exclusion.

In its response, dated March 31, 2004, the applicant clarified that all the concrete structural elements of the auxiliary building foundation (as described in the FSAR) are within the scope of license renewal. The staff finds the applicant's clarification acceptable.

2.4.2.2 Diesel Generator Building

2.4.2.2.1 Summary of Technical Information in the Application

In Section 2.4.2.2 of the LRA, the applicant described the diesel generator building.

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the diesel generator building SSCs that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.4.2.2 of the LRA, the applicant identified the diesel generator building component types that are within the scope of license renewal and subject to an AMR, including compressible joints and seals, concrete (exterior abovegrade), concrete (foundation), concrete (interior), concrete (roof slab), nonfire doors, fire doors, fire seals, masonry walls (all), penetration sleeves, and steel components (all structural steel).

2.4.2.2.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.2 and the referenced FNP FSAR Sections 2B.6.5 and 3.8. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all diesel generator building structural or component functions as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff found that the applicant included those portions of the diesel generator building that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and identified them as such in LRA Section 2.4.2.2. Table 2.4.2.2 of the LRA includes the specific component types that are subject to an AMR, in accordance with 10 CFR 54.4(a) and 10 CFR 54.21(a)(1).

2.4.2.3 Turbine Building

2.4.2.3.1 Summary of Technical Information in the Application

In Section 2.4.2.3 of the LRA, the applicant described the building.

In Table 2.2-1e of the LRA, the applicant identified the criteria it used to determine the turbine building SSCs that are within the scope of license renewal:

- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.4.2.3 of the LRA, the applicant identified the building component types that are within the scope of license renewal and subject to an AMR, including concrete (exterior abovegrade), concrete (exterior belowgrade), concrete (foundation), concrete (interior), concrete (roof slab), and steel components (all structural steel).

2.4.2.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.3 and the referenced FNP FSAR Section 2B.6.9. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the turbine building as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff found that the applicant included those portions of the turbine building that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and identified them as such in LRA Section 2.4.2.3. Table 2.4.2.3 of the LRA includes the specific component types that are subject to an AMR, in accordance with 10 CFR 54.4(a) and 10 CFR 54.21(a)(1).

2.4.2.4 Utility Piping Tunnels

2.4.2.4.1 Summary of Technical Information in the Application

In Section 2.4.2.4 of the LRA, the applicant described the utility/pipping tunnels.

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the utility piping tunnel SSCs that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))

In Table 2.4.2.4 of the LRA, the applicant identified the utility/piping tunnels component types that are within the scope of license renewal and subject to an AMR, including compressible joints and seals, concrete (exterior abovegrade), concrete (exterior belowgrade), and structural steel.

2.4.2.4.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.4 and the referenced FNP FSAR Section 3.8. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the utility/piping tunnels as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff found that the applicant included those portions of the utility/piping tunnels that meet the scoping requirements of 10 CFR 54.4 within the scope of license renewal and identified them as such in LRA Section 2.4.2.4. Table 2.4.2.4 of the LRA includes the specific component types that are subject to an AMR, in accordance with 10 CFR 54.4(a) and 10 CFR 54.21(a)(1).

2.4.2.5 Water Control Structures

2.4.2.5.1 Summary of Technical Information in the Application

In Section 2.4.2.5 of the LRA, the applicant described the water control structures.

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the water control structure SSCs that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))

In Table 2.4.2.5 of the LRA, the applicant identified the water control structures component types that are within the scope of license renewal and subject to an AMR, including concrete (exterior abovegrade), concrete (exterior belowgrade), concrete (foundation), concrete (interior), concrete (roof slab), nonfire doors, earthen water-control structures (dams, embankment), fire doors, fire seals, masonry walls (all), steel components (all structural steel), stop logs, and traveling screen.

2.4.2.5.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.5 and the referenced FNP FSAR Sections 2.4.8.1, 2B.6, 2B.7, and 3.8. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the water control structures as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of the LRA Section 2.4.2.5 identified one area in which it needed additional information to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated February 13, 2004, the staff issued RAI 2.4-5 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's RAI 2.4-5:

> To completely clarify the scope of the ultimate heat sink structures, provide the following additional information:
>
> (1) Describe the River Water system that transports water from the river water intake structure to the storage pond and explain why the structures in this system are not within the scope of license renewal. Also, can there be a reverse flow of water that can reduce the water level in the storage pond, and consequently jeopardize the ultimate heat sink? What structures would prevent such an occurrence and are they included in the LR scope?
>
> (2) In LRA Section 2.4.2.5, the discussion of the Storage Pond Spillway Structure does not include a description of the Spillway Intake and Discharge Canals. These canals are described in FSAR Section 2.4.8.2. Further information on these canals (channels) is provided in FSAR Section 2.4.14.2, which states:
>
> The spillway channel shall be inspected after each operation of sufficient magnitude to have a potential for erosion. A discharge of 80 ft3/s corresponding to a pool at elevation 187.0 has been selected as the minimum flow for which inspection shall be required. At this discharge the flow in the grassed discharge channel would have an average velocity of about 1.3 ft per second with a flow

depth of 1.3 ft. The pond level will be monitored in the control room. Whenever the operator observes or inspection of the chart indicates that the pool level is greater than or equal to elevation 187.0, the channels and structure shall be inspected at the end of the discharge period, as required by the Technical Requirements Manual. Eroded areas that affect or can affect the channel bank slopes or that are more than 4 ft deep should be promptly repaired. Because of the expected infrequent use of the spillway, the channels and structure shall also be inspected biennially, as required by the Technical Requirements Manual.

In light of the above information, clarify whether the Spillway Intake and Discharge Canals are within the scope of license renewal. If not, explain why not.

In its response to RAI 2.4-5, part 1, dated March 12, 2004, the applicant stated the following:

> Except for some pond level switches and associated tubing (addressed in LRA Tables 2.3.3.5 and 2.3.3.7), the river water system at FNP is not in the scope of license renewal because it does not meet the criteria of 10 CFR 54.4(a). The storage pond is supplied from the river water system and the supply line outlet is physically located above the storage pond's normal water level as well as above the minimum emergency water level. Although the supply line outlet is slightly below the pond's maximum possible flood level (spillway elevation), any siphoning effect would be broken well before the pond water level reached the normal elevation or the minimum emergency elevation. Any reverse flow of water from the storage pond to the river via a siphoning effect in the river water system cannot deplete that portion of the pond's volume credited for emergency use. Therefore, the pond volume relied upon in an emergency cannot be depleted via the river water system.

In its response to RAI 2.4-5, part 2, dated March 12, 2004, the applicant stated the following:

> The Spillway Intake and Discharge Canals are earthen canal design features for directing the spillage flow from the emergency cooling pond (ultimate heat sink) resulting from an unusual rainfall/flooding event (exceeding the maximum 5-year storm per UFSAR Section 2.4.14.2). The Spillway Intake and Discharge Canals do not perform a safe shutdown or accident mitigation function and therefore do not meet the scoping criteria of 10 CFR 54.4(a)(1). These features do not perform a function that demonstrates compliance with the Commission's regulations for any of the events listed in 10 CFR 54.4(a)(3). In addition, there is no failure mode for the canals that can adversely affect a safety related function or the performance of safety related equipment and therefore do not meet the scoping criteria of 10 CFR 54.4(a)(2). The canals are inspected periodically and after any significant discharge event as stated in UFSAR Section 2.4.14.2, therefore the current licensing basis ensures the material condition of the canals is maintained. UFSAR Section 2.4.8.2 states for the canals that "Additional erosion protection is not required since the spillway structure is designed to prevent impairment of emergency cooling pond banks in the unlikely event of extreme channel erosion and degradation." Therefore, the spillway structure "protects" the emergency cooling pond banks and is in scope for license renewal, but the canals do no meet any of the 10 CFR 54.4(a) scoping criteria. (The Storage Pond Spillway Structure is in the scope of License Renewal as indicated in LRA Table 2.2-1e and Section 2.4.2.5.)
>
> In summary, these canals do not satisfy the criteria as defined in 10 CFR 54.4(a) and so are not within the scope of license renewal.

Based on its review, the staff finds the applicant's response to parts 1 and 2 of RAI 2.4-5 acceptable because it clearly and concisely describes the technical basis for excluding the river water system and the spillway intake and discharge canals from the scope of license renewal. The staff concurs with the applicant's conclusions.

Therefore, the staff considers its concern described in RAI 2.4-5 resolved.

2.4.2.6 Steel Tank Structures (Foundations and Retaining Walls)

2.4.2.6.1 Summary of Technical Information in the Application

In Section 2.4.2.6 of the LRA, the applicant described the steel tank structures.

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the steel tank structure SSCs that are within the scope of license renewal.

- safety-related (10 CFR 54.4(a)(1))
- fire protection (10 CFR 54.4(a)(3))

In Table 2.4.2.6 of the LRA, the applicant identified the steel tank structures (foundation and retaining walls) component types that are within the scope of license renewal and subject to an AMR, including bolting, concrete pedestal, concrete (exterior abovegrade shielding and retaining walls), concrete (foundation), and steel components (all structural steel).

2.4.2.6.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.6 and the referenced FNP FSAR Sections 3.8, 6.2.2, 6.3, 9.2.7, 9.5.4, and 9B.4.2.1. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the steel tank structures (foundations and retaining walls) as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of the LRA Section 2.4.2.6 identified one area in which it needed clarification to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 2, 2004, the staff requested a clarification to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a). The following describes the staff's request for clarification.

Section 2.4.2.6, "Steel Tank Structures (Foundations and Retaining Walls)," of the LRA states the following:

> The Emergency Diesel Generator Fuel Oil Storage Tanks are 40,000 gallon, seismic category I underground tanks. The tanks are supported by poured concrete and buried for protection.

Table 2.4.2.6 of the LRA does not specifically identify a component type to cover a buried concrete foundation. Therefore, the staff requested the applicant to confirm that the subject buried concrete foundation is within the scope of license renewal and to identify the component type in LRA Table 2.4.2.6 that includes this foundation.

In its response, dated March 31, 2004, the applicant confirmed that the buried concrete foundation for the EDG fuel oil storage tanks is in the scope of license renewal and further stated the following:

> The component type “Concrete: Foundation” in LRA Table 2.4.2.6 is applicable to the Emergency Diesel Generator Fuel Oil Storage Tanks buried concrete foundation. The buried environment is identified in LRA Table 3.5.2-7 component type “Concrete: Foundation” with a corresponding environment of Below Grade, and is inclusive of the Emergency Diesel Generator Fuel Oil Storage Tanks buried concrete foundations.

The staff finds the applicant’s clarification acceptable.

2.4.2.7 Yard Structures

2.4.2.7.1 Summary of Technical Information in the Application

In Section 2.4.2.7 of the LRA, the applicant described the yard structures.

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the yard structure SSCs that are within the scope of license renewal:

- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.4.2.7 of the LRA, the applicant identified the yard structure component types that are within the scope of license renewal and subject to an AMR, including bolting, concrete (foundation), equipment frames and housings, fire door, masonry wall, and steel components (all structural steel).

2.4.2.7.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2.7 and the referenced FNP FSAR Sections 8.2.1, 9B.4.2.1, 11.3.7, and 11.5. The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the yard structures as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff’s review of the LRA Section 2.4.2.7 identified one area in which it needed additional information to complete the evaluation of the applicant’s scoping and screening results. Therefore, by letter dated February 13, 2004, the staff issued RAI 2.4-2 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff’s RAI:

> In LRA Section 2.4.2.7, the plant vent stacks are identified as “yard structures.” However, in the first paragraph, it is stated “The plant vent stacks are evaluated as part of the Auxiliary and Radwaste Ventilation System in Section 2.3.3.10.” In LRA Section

2.4.2.7, under the heading “Plant Vent Stack”, it states “The vent stack is a Seismic Category I structure that is not required for safe shutdown” and “The vent stack is a non safety-related structure but its function is to maintain its structural integrity during a design basis event such that it does not impact other SR structures or components.” It appears that the plant vent stacks are in the LR scope for seismic II/I considerations. LRA Table 2.3.3.10 does not list the plant vent stacks as a “Component Type.” Please clarify which section of the LRA Chapter 2 includes the plant vent stacks (and their foundations) in its scope, and also identify where the AMR for the plant vent stacks (and their foundations) is explicitly listed in Chapter 3.5 tables of the LRA.

In its response to RAI 2.4-2, dated March 12, 2004, the applicant stated the following:

The plant vent stacks are in LR scope as meeting the criteria identified in 10 CFR 54.4(a)(2).

The last sentence of the first paragraph of Section 2.4.2.7, “Yard Structures,” which is quoted in the RAI, should have read (changes indicated in bold italics):

“The plant vent stacks’ noble gas radiation monitors are evaluated as part of the Auxiliary and Radwaste Ventilation System in Section 2.3.3.10.”

The vent stack structural elements are addressed in LRA Sections 2.4.2 and 3.5 as discussed below.

Each unit’s plant vent stack is a steel tubular structure used as a gaseous release point for various process, filtration and ventilation systems. Each plant vent stack is anchored at its base to the Auxiliary Building’s ground level (155' elev.) floor slab, and laterally restrained where it exits the Auxiliary Building roof. Lateral restraints provided between the top of the stack and the roof are mounted to the containment structure.

Supporting steel for the vent stack is addressed in the Yard Structures evaluation in the component type “Steel components: All Structural Steel” in Tables 2.4.2.7 and 3.5.2-8. The vent stack foundation is addressed in the Auxiliary Building evaluation in the component type “Concrete: Interior” listed in Tables 2.4.2.1 and 3.5.2-2.

The tubular steel portion of the vent stack is not specifically addressed in the LRA tables but is shown in the Structural Monitoring Program scope for license renewal as detailed in LRA Section B.4.3.5. Table 2.4.2.7, “Yard Structures Component Types Subject to Aging Management Review and their Intended Functions,” should have included the following line item:

Component Type	Intended Function
Steel Vent Stack	NSR Structural Support

Correspondingly, the aging management review summary for Yard Structures in LRA Table 3.5.2-8 should have included the following entry:

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Item	Table 1 Item	Note #
Steel Vent Stack	NSR Structural Support	Carbon Steel	Outside	Loss of Material	Structures Monitoring Program	III.B6.1-a	3.5.1-29	C

Based on its review, the staff finds the applicant’s response to RAI 2.4-2 acceptable because it corrects and clarifies the evaluation of the plant vent stacks contained in the LRA. The applicant identified a correction to LRA Section 2.4.2.7 and additions to LRA Tables 2.4.2.7 and 3.5.2-8, which clearly indicate that the structures scope includes the plant vent stacks and LRA Section 3.5 includes the AMR results.

Therefore, the staff considers its concern described in RAI 2.4-2 resolved.

2.4.2.8 Conclusion

During its review of the information in the LRA, license renewal drawings, and licensing basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping results for the other structures. The staff concludes that the applicant has adequately identified the other structures and associated components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the other structures and associated components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.3 Component Supports

2.4.3.1 Summary of Technical Information in the Application

In Section 2.4.3 of the LRA, the applicant stated that component supports group includes specific types of support elements located within in-scope structures. Physical interfaces exist with the structure, system, or component being supported and with the building structural element to which the support is anchored. As a primary function, a support anchors the supported element for DBEs so the supported element can perform its intended function. The individual structure's description identifies the supports within a structure that are included in the scope of license renewal for FNP. The in-scope items include support members, welds, bolted connections, anchorage (including base plate and grout) to the building structure, spring hangers, guides, vibration isolators, and building concrete at bolt locations.

The discussions of the component support elements fall under the following headings:

- supports for ASME and non-ASME piping and components
- supports for cable trays, conduit, HVAC ducts, tube track, instrument
- anchorage of racks, panels, cabinets, and enclosures for electrical equipment and instrumentation
- supports for emergency diesel generator, HVAC system components, and other miscellaneous
- supports for platforms, pipe whip restraints, jet impingement shields, and other miscellaneous structures

In Table 2.2-1e of the LRA, the applicant identified the following criteria it used to determine the component support SSCs that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))

- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))

In Table 2.4.3 of the LRA, the applicant identified the component support component types that are within the scope of license renewal and subject to an AMR, including battery racks; RPV supports; American Society of Mechanical Engineers (ASME) and non-ASME piping and component support members (support members, welds, bolted connections, support anchorage to building structure); constant and variable load spring hangers, guides, and stops; sliding surfaces and vibration isolators (for ASME piping and components); cable tray, conduit, HVAC ducts, tube track (support members welds, bolted connections, support anchorage to building structure); and racks, panels, and cabinets (support members, welds, bolted connections, support anchorage to building structure).

2.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.3 and the referenced FNP FSAR Sections 3.2, 3.6.5.1, 3.7.3.14, 3.8, 5.5, 9.4, and Appendix 3K (Attachment B). The staff conducted its review in accordance with the guidance described in Section 2.4 of NUREG-1800.

In its evaluation, the staff reviewed the FSAR to determine if the applicant identified all structural or component functions of the component supports as an intended function, in accordance with the requirements of 10 CFR 54.4(a). The staff did not identify any omissions. The staff then evaluated that the passive, long-lived components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review of the LRA Section 2.4.3 identified one area in which it needed clarification to complete the evaluation of the applicant's scoping and screening results. Therefore, by letter dated March 2, 2004, the staff requested a clarification to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following describes the staff's request for clarification:

> LRA Table 2.3.1.3 identifies "Pressurizer—Support Lugs" and "Pressurizer Support Skirt and Flange," with a "Structural Support" intended function. These component types appear to be the ASME Class 1 component support for the pressurizer. However, LRA Section 2.4.1.4 "Containment Internal Structures" states "RCS supports are addressed in Section 2.4.3, "Component Supports." LRA Section 2.4.3.1 "Supports for ASME and Non-ASME Piping and Components" describes the supports for the reactor vessel, steam generator, reactor coolant pumps, and pressurizer. In order to clarify the treatment of pressurizer supports in the LRA, please
>
> (1) verify that the ASME Class 1 component supports for the reactor vessel, steam generators, reactor coolant pumps, and pressurizer are included in the Structures scope, under Component Supports. In LRA Table 2.4.3, only "RPV Supports" are explicitly identified.
>
> (2) explain the Pressurizer—Support Lugs and Pressurizer—Support Skirt and Flange entries in LRA Table 2.3.1.3.

In its response, dated March 31, 2004, the applicant confirmed that the structures scope includes the ASME Class 1 component supports for the reactor vessel, steam generators, RCPs, and pressurizer under component supports in LRA Section 2.4.3.1. LRA Table 2.4.3 lists

RPV supports as a unique component type. Table 2.4.3 of the LRA includes supports for steam generators, RCPs, and pressurizers under the component type “ASME and non-ASME piping and component support members.”

The applicant further explained that the pressurizer support skirt and flange is welded to the bottom portion of the pressurizer vessel, and the pressurizer support lugs are welded to the upper head of the pressurizer and are integral with the pressurizer. Section 2.3 of the LRA evaluates these pressurizer subcomponents with the pressurizer. Section 2.4.3 of the LRA evaluates structural support members interfacing with the pressurizer support lugs and support skirt and flange as structural components. The staff finds the applicant’s clarification acceptable.

2.4.3.3 Conclusion

The staff reviewed the LRA and related structural/component information to determine whether the applicant identified all SSCs that should be within the scope of license renewal. The staff found no omissions. In addition, the staff performed an independent assessment to determine whether the applicant identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the components of the component supports that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified the components of the component supports that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results—Electrical and Instrumentation and Controls Systems

This section addresses the scoping and screening results of electrical and I&C systems at FNP for license renewal. According to 10 CFR 54.21(a)(1), an applicant must identify and list SCs subject to an AMR. These are passive, long-lived SCs that are within the scope of license renewal. To verify that the applicant properly implemented its methodology, the staff focuses its review on the implementation results. Such a focus allows the staff to confirm that the applicant has omitted no electrical system components that are subject to an AMR. If the review identifies no omission, the staff has the basis to find that the applicant has identified the electrical system components that are subject to an AMR.

On the basis of this review, the staff requested additional information during the staff’s audit of the FNP License Renewal Program from November 3–7, 2003. The staff also requested additional information in a letter dated March 29, 2004. The applicant responded to these requests for additional information in letters to the staff dated December 5, 2003, and April 29, 2004.

Staff Evaluation Methodology

The staff evaluated the information provided in the LRA in the same manner for all electrical and I&C systems. Through the review, the staff determined if the applicant identified the SSCs for a specific electrical or I&C system that appeared to meet the scoping criteria specified in the Rule 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 components were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

Scoping. To perform its evaluation, the staff reviewed the applicable LRA section and associated component drawings, focusing its review on components that the applicant had not identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the FSAR, for each electrical and I&C component 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 licensing basis documents to determine if the LRA specified all intended functions delineated under 10 CFR 54.4(a). If it identified omissions, the staff requested additional information to resolve the discrepancy.

Screening. Once the staff completed its review of the scoping results, it evaluated the applicant's screening results. For those SCs with intended functions, the staff sought to determine if the functions are performed with moving parts or a change in configuration or properties, or 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 electrical and I&C components were subject to an AMR, as required by 10 CFR 54.21(a)(1). If it identified discrepancies, the staff requested additional information to resolve them.

2.5.1 Summary of Technical Information in the Application

For electrical and I&C systems, the applicant used a bounding approach as described in NEI 95-10. The applicant identified electrical and I&C component types subject to an AMR by applying the criteria of 10 CFR 54.21(a)(1). The applicant reviewed these electrical commodity groups (determined to be passive) to identify those that are not subject to replacement based on a limited qualified life or specified period. Based on its review, the applicant determined that the following electrical and I&C component commodity groups are subject to an AMR:

- electrical cables and connectors not subject to 10 CFR 50.49 EQ requirements
- electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance
- electrical connectors not subject to 10 CFR 50.49 EQ requirements exposed to borated water leakage
- inaccessible medium voltage electrical cables not subject to 10 CFR 50.49 EQ requirements
- fuse holders
- high voltage insulators
- metal enclosed cable bus
- oil-static cable
- switchyard bus

- transmission conductors

All other electrical and I&C component commodity groups are either active, subject to replacement based on a qualified life or specified time period, or not subject to an AMR because they do not perform any intended functions.

In Table 2.5.1 of the LRA, the applicant listed the electrical component types subject to AMR and their intended functions.

In Table 2.2-1f of the LRA, the applicant identified the plantwide electrical and I&C systems and structures within the scope of license renewal. It used to the following criteria to determine the plantwide electrical and I&C systems and structures that are within the scope of license renewal:

- safety-related (10 CFR 54.4(a)(1))
- nonsafety-related that can prevent a safety-related function (10 CFR 54.4(a)(2))
- fire protection (10 CFR 54.4(a)(3))
- environmental qualification (10 CFR 54.4(a)(3))
- anticipated transient without scram (10 CFR 54.4(a)(3))
- station blackout (10 CFR 54.4(a)(3))
- pressurized thermal shock (10 CFR 54.4(a)(3))

2.5.2 Staff Evaluation

The staff reviewed LRA Section 2.5 to determine whether the applicant identified the electrical and I&C systems and components within the scope of license renewal and subject to an AMR, in accordance with 10 CFR 54.4 and 10 CFR 54.21(a)(1).

In its evaluation, the staff selected system functions described in the FSAR that were set forth in 10 CFR 54.4 to verify that the applicant did not omit components having intended functions from the scope of the Rule. The staff also reviewed drawings and focused on components that the applicant did not identify as subject to an AMR to determine if it had omitted any components.

Section 2.5, Table 2.5.1, of the LRA does not include the transmission connections in the AMR. During its audit, the staff requested that the applicant clarify why it did not include transmission connections with transmission conductors. In response to the staff request, in a letter dated December 5, 2003, the applicant stated that the component type “transmission conductors” is a general category and does not itemize all components within the category. The component type “transmission conductors” includes the transmission conductors and the hardware used to secure the conductors to high-voltage insulators. The AMR for transmission conductors includes transmission connections. Based on this information, the staff concludes that the applicant did not omit transmission connections at FNP.

Table 2.5.1 of the LRA lists electrical cables and connectors subject to an AMR. However, it does not include splices, terminal blocks, and fuse holders. The staff requested the applicant to clarify why it did not include splices, terminal blocks, and fuse holders in the AMR. In a letter dated December 5, 2003, the applicant responded that the category “electrical cables and connections not subject to 10 CFR 50.49 EQ requirements” includes splices, connectors, terminal blocks, and fuse holders. The AMR for connections include splices, terminal blocks, and fuse holders. Based on this information, the staff concludes that the applicant did not omit splices, terminal blocks, and fuse holders at FNP.

Table 2.2-1f of the LRA lists nonsegregated buses as SCs within the scope of license renewal. However, scoping and screening results (Section 2.5 of the LRA) do not include these components in the AMR. Nonsegregated buses are long-lived, passive components and should be included in an AMR. The staff requested the applicant to clarify why it did not include the nonsegregated buses in the AMR. The applicant responded, in a letter dated December 5, 2003, that the nonsegregated buses item listed in Table 2.2-1f is the same equipment as the metal enclosed bus listed in Table 2.5.1. The applicant performed an AMR for the metal enclosed bus. Based on this information, the staff concludes that the applicant did not omit the nonsegregated phase buses at FNP.

Section 2.5 of the LRA does not include non-EQ electrical penetrations in the AMR. Non-EQ electrical penetrations within the scope of license renewal are considered passive, long-lived components that require an AMR. The staff requested the applicant to clarify if there is any non-EQ electrical penetration and why there is no non-EQ containment penetration AMP. The applicant responded, in a letter dated December 5, 2003, that FNP has both EQ and non-EQ electrical penetrations. The Inservice Inspection Program covers the pressure boundary function of both EQ and non-EQ electrical penetrations. The Non-EQ Cables and Connections Program will cover the electrical portions of penetrations that provide a connection function for nonsafety-related equipment. Based on this information, the staff concludes that the applicant has adequately identified the non-EQ electrical penetrations that are subject to an AMR.

Table 2.2-1i of the LRA lists grounding systems as a system that is not within the scope of license renewal. The staff requested the applicant to explain why it omitted the grounding system from the scope of license renewal. In a letter dated December 5, 2003, the applicant responded that uninsulated ground conductors are electrical conductors (e.g., copper cable, copper bar, steel bar) that are used to make ground connections for electrical equipment. Ground connections are made to electrical equipment housing and enclosures, as well as metal structures such as cable tray systems and building structural steel. The ground conductors are isolated from the electrical operating circuits. Uninsulated ground conductors have the following basic functions:

- provide a common electrical ground reference for all electrical and electronic equipment
- enhance the capability of the electrical system to withstand electrical system disturbances (e.g., electrical faults, lightning surges) for equipment and personnel protection

Uninsulated ground conductors do not perform or support any safety-related functions or any of the functions identified in 10 CFR 54.4(a). Uninsulated ground conductors are not relied on to remain functional during or following any DBE. Therefore, no failures of insulated ground conductors could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a).

The accident analysis in Chapter 15 of the FSAR did not consider any failures of uninsulated ground conductors. Because the analysis did not consider any failures, a failure mode and effects analysis is not required. The FNP has not experienced an age-related failure of an uninsulated ground conductor. Because the FNP CLB does not include failures of uninsulated ground conductors, FNP has not experienced such failures previously, and such failures have not been reported as industry operating experience, the failure of uninsulated ground conductors does not require consideration.

Based on this response, the staff concludes that uninsulated ground conductors do not perform or support any safety-related functions or any of the regulated events identified in 10 CFR 54.4(a). Therefore, the passive electrical commodity of uninsulated ground conductors is not within the scope of license renewal.

In ISG-2, "NRC Staff Position on License Renewal Rule (10 CFR 54.4) As It Relates to the Station Blackout Rule (10 CFR 50.63)," the staff states the following:

> The offsite power systems consist of a transmission system (grid) component that provides a source of power and a plant system component that connects the power source to a plant's onsite electrical distribution systems which power safety equipment. For the purpose 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.

The staff requested the applicant to provide a detail description of the FNP recovery path and discuss how it included the recovery path within the scope of license renewal rule, in compliance with ISG-2. The staff also requested the applicant to clarify how the offsite power source feeds startup transformers 2A, 1A, and 1B without using breakers 830, 820, and 800. In response to the staff's request, the applicant, in a letter dated April 29, 2004, responded that, per ISG-2, the FNP LRA scope for SBO includes the switchyard circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between the circuit breaker and transformer and onsite electrical distribution system, the associated control circuits, and structures in the path to restore offsite power.

The applicant further explained that multiple sources in the 230 kV and 500 kV switchyards can feed startup transformers 1A, 1B, 2A, and 2B. The path shown on the LRA boundary drawings (D-169970L sheets 1, 2, and 3 and D-173096L sheet 1) utilizes the preferred power source (230 kV Bainbridge line) per the FNP procedures for restoring Unit 1 and 2 offsite power following a wide-area blackout. Switchyard circuit breakers 840, 934, 924, and 904 represent the first isolation device upstream from the startup transformers and demarcate the FNP SBO recovery path from the transmission system. This path allows for the restoration for all four startup transformers once the preferred 230 kV source is restored. Breakers 830, 820, and 800 could provide a direct path to individual transmission lines, but the use of these breakers would require restoration of multiple transmission lines before all four startup transformers could be powered. The 4.16 kV safety buses receive their power from one of the two secondary windings for each startup transformer, as shown on D-173096L. A nonsegregated cable bus duct system provides the path between the startup transformers and the 4.16 kV safety buses.

The applicant has included the plant system portion of the offsite power system that is used to connect the plant to the offsite power source in the scope of the Rule. This path includes (1) the switchyard circuit breakers that are utilized to recover the offsite power source from the transmission system (per plant ac power restoration procedure) that connects directly to the startup transformers, (2) the transformers themselves, (3) the intervening overhead or underground circuits between the circuit breaker and the transformer and between the transformer and the onsite electrical distribution system, and (4) the associated control wiring. Based on this information, the staff concludes that the applicant did not omit the SBO recovery path at FNP.

2.5.3 Conclusion

On the basis of this review, the staff concludes that the applicant has adequately identified the electrical and I&C systems and components that are within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a), and that the applicant has adequately identified the electrical and I&C systems components that are subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.6 Conclusion for Scoping and Screening

The staff has reviewed the information in Section 2, "Structures and Components Subject to Aging Management Review," of the LRA. The staff determined the applicant's scoping and screening methodology, including its supplemental 10 CFR 54.4(a)(2) review which brought additional nonsafety-related piping segments and associated components into the scope of license renewal, was consistent with the requirements of 10 CFR 54.21(a)(1) and the staff's position on the treatment of safety and nonsafety-related SSCs. On the basis of its review, the staff concludes that the applicant's methodology for identifying the SSCs within the scope of license renewal and the structures and components requiring an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

In addition to reviewing Section 2 of the LRA, the staff reviewed the accompanying scoping boundary drawings to determine whether the applicant had omitted any SSCs that should be within the scope of license renewal. The staff did not identify any omissions. Also, the staff performed an independent assessment to determine if the applicant had identified all components that should be subject to an AMR. The staff found no omissions. On the basis of its review, the staff concludes that the applicant has adequately identified those systems and components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant has adequately identified those systems and components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

With regard to these matters, the NRC staff has concluded that there is reasonable assurance that the activities authorized by the renewed licenses will continue to be conducted in accordance with the current licensing basis, and that any changes made to the FNP current licensing basis in order to comply with 10 CFR 54.29(a) are in accord with the Act and the Commission's regulations.

3. AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation report (SER) for the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, describes the U.S. Nuclear Regulatory Commission (NRC) staff's (the staff) evaluation of the Southern Nuclear Operating Company, Inc.'s (SNC or the applicant) aging management programs (AMPs) and aging management reviews (AMRs). In Appendix B to the LRA, the applicant describes the 21 AMPs that it relies on to manage or monitor the aging of long-lived, passive components and structures. By letter dated June 4, 2004, the applicant supplemented the program discussions in Appendix B to the license renewal application (LRA) by providing a new AMP, Section B.5.9, "Periodic Surveillance and Preventive Maintenance Activities," which was not in the original application. In Section 3 of the LRA, the applicant provided the results of the AMRs for those structures and components (SCs) that it identified in Section 2 of the LRA as within the scope of license renewal and subject to an AMR.

3.0 Applicant's Use of the Generic Aging Lessons Learned (GALL) Report

In preparing its LRA, SNC credited NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," dated July 2001. The GALL Report contains the staff's generic evaluation of the existing plant programs and documents the technical basis for determining if existing programs are adequate without modification or if they 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 structures or components for license renewal without change. The GALL Report also contains recommendations on specific areas for which existing programs should be augmented for license renewal. An applicant may reference the GALL Report in its LRA to demonstrate that the programs at its facility correspond to those reviewed and approved in the report.

The purpose of the GALL Report is to provide the staff with a summary of staff-approved AMPs to manage or monitor the aging of SCs that are subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources used to review an applicant's LRA will be greatly reduced, thereby improving the efficiency and effectiveness of the license renewal review process. The GALL Report also serves as a reference for applicants and staff reviewers to quickly identify those AMPs and activities that the staff has determined will adequately manage or monitor aging during the period of extended operation.

The GALL Report identifies (1) systems, structures, and components (SSCs), (2) SC materials, (3) the environments to which the SCs are exposed, (4) the aging effects associated with the materials and environments, (5) the AMPs that are 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 using the GALL Report would improve the efficiency of the license renewal review, the staff conducted a demonstration project to exercise the GALL process and to determine the format and content of a safety evaluation (SE) based on this process. The results of the demonstration project confirmed that the GALL process will improve the efficiency and effectiveness of the LRA review, while maintaining the staff's focus on public health and safety. NUREG-1800, "Standard Review Plan for the Review of License Renewal Applications," dated April 2001 (SRP-LR), is based on both the GALL Report model and the lessons learned from the demonstration project.

The staff performed its work in accordance with the requirements of Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR Part 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," the guidance provided in NUREG-1800, the guidance provided in NUREG-1801, and the "Audit and Review Plan for Plant Aging Management Reviews and Programs, Joseph M. Farley Nuclear Plant, Units 1 and 2," dated April 29, 2004 (ML042540243).

3.0.1 Format of the License Renewal Application

The SNC submitted an application that followed the standard LRA format, as agreed to by the NRC staff and the Nuclear Energy Institute (NEI) (see letter dated April 7, 2003, ML030990052). This revised LRA format incorporates lessons learned from the staff's review of five previous LRAs submitted using a format developed from information gained during an NRC staff and NEI demonstration project.

The organization of Section 3 of the LRA parallels Chapter 3 of NUREG-1800. The AMR results discussed in Section 3 of the LRA are presented in the following two types of tables:

(1) Table 1. 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 is the first table of this type in Section 3 of the LRA.

(2) Table 2. Table 3.x.2-y—where "3" indicates the LRA section number, "x" indicates the subsection number of the GALL Report, "2" indicates that this is the second table of this type in Section 3 of the LRA, and "y" indicates the system table number.

The content of the previous applications and the FNP application is essentially the same. The revised format used for the FNP application modifies the tables in Section 3 to provide additional information to assist the staff in its review. In Table 1, the applicant summarized the portions of the application it considered to be consistent with the GALL Report. In Table 2, the applicant identified the linkage between the scoping and screening results detailed in Section 2 of the LRA and the AMRs identified in Section 3 of the LRA.

3.0.1.1 Overview of Table 1

Table 3.x.1 (Table 1) provides a summary comparison of how the facility aligns with the corresponding tables of the GALL Report, Volume 1. The table is essentially the same as Tables 1 through 6 in the GALL Report, Volume 1, 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 provides the reviewer with a means to cross-reference Table 2 to Table 1. The applicant used the Discussion column to provide clarifying/amplifying information. The following are examples of information that might be contained within this column:

- further evaluation recommended—information or reference to where that information is located

- the name of a plant-specific program being used

- exceptions to the GALL Report assumptions

- discussion of how the line is consistent with the corresponding line item in the GALL Report, when that correspondence may not be intuitively obvious

- discussion of how the item differs from the corresponding line item in the GALL Report (e.g., when there is exception taken to a GALL AMP)

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

3.0.1.2 Overview of Table 2

Table 3.x.2-y (Table 2) provides the detailed results of the AMRs for those components identified in LRA Section 2 as subject to an AMR. The LRA contains a Table 2 for each of the components or systems within a system grouping (e.g., reactor coolant systems, engineered safety features, auxiliary systems, etc.). For example, the engineered safety features group contains tables specific to the containment spray system, containment isolation system, and emergency core cooling system. Table 2 consists of the following nine columns:

(1) Component Type. The first column identifies the component types from Section 2 of the LRA that are subject to AMR. The component types are listed in alphabetical order.

(2) Intended Function. The second column identifies the license renewal intended functions (including abbreviations where applicable) for the listed component types. The intended functions table in LRA Section 2 provides the definitions and abbreviations of intended functions.

(3) Material. The third column lists the particular materials of construction for the component type.

(4) Environment The fourth column lists the environment to which the component types are exposed. Internal and external service environments are indicated, and the Internal Service Environments and External Service Environments tables of LRA Section 3 provide a list of these environments.

(5) Aging Effect Requiring Management. The fifth column lists aging effects requiring management (AERMs). As part of the AMR process, the applicant determined any AERM for each material-environment combination.

(6) Aging Management Programs. The sixth column lists the AMPs the applicant used to manage the identified aging effects.

(7) GALL Volume 2 Item. The seventh column lists the GALL Report item that the applicant identified as similar to the AMR results presented in its LRA. The applicant compared each combination of component type, material, environment, AERM, and AMP in Table 2 of the LRA to the items in the GALL Report. If the GALL Report did not have a corresponding item, the applicant left the column blank. In this way, the applicant identified the AMR results in the LRA tables that correspond to items in the tables in the

GALL Report.

(8) Table 1 Item. The eighth column lists the corresponding summary item number from LRA Table 1. If the applicant identified AMR results in Table 2 that are consistent with the GALL Report, then the associated Table 3.x.1 line summary item number is listed in Table 2. If there is no corresponding item in the GALL Report, then column 8 is left blank. This allows the information from the two tables to be correlated.

(9) Notes. The ninth column lists the corresponding notes that the applicant used to identify how the information in Table 2 aligns with the information in the GALL Report. The notes identified by letters were developed by an NEI working group and will be used in future LRAs. Plant-specific notes are identified by a number and provide additional information concerning the consistency of the line item with the GALL Report.

3.0.2 The Staff's Review Process

The staff conducted the following three types of evaluations of the AMRs and associated AMPs:

(1) For items the applicant stated were consistent with the GALL Report, the staff audited the applicant's technical justifications for consistency.

(2) For items the applicant stated were consistent with the GALL Report with exceptions, the staff conducted an audit of the item and of the applicant's technical justification for the exceptions.

(3) For other items, the staff conducted a technical review.

The staff performed onsite audits and technical reviews of the license renewal applicant's AMPs and AMRs for evaluation types (1) and (2) above. Details of the staff's the audit and review are documented in the "Audit and Review Report for Plant Aging Management Reviews and Programs, Joseph M. Farley Nuclear Plant, Units 1 and 2 (FNP Audit and Review Report)," dated September 10, 2004 (ML042540277). The onsite audits and reviews were performed from November 3 to November 7, 2003; December 15 to December 19, 2003; and February 24 to February 26, 2004, to determine whether the AMPs and the AMR results that the applicant claimed were consistent with the GALL Report were actually consistent.

3.0.2.1 Review of AMPs

For those AMPs for which the applicant claimed consistency with the GALL AMPs, the staff conducted an AMP audit to determine whether the applicant's claim is consistent as claimed. For each AMP that had one or more deviations, the staff evaluated each deviation to determine (1) whether the deviation was acceptable, and (2) whether the AMP, as modified, would adequately manage the aging effects for which it was credited.

For AMPs that the applicant claimed were plant-specific or were not evaluated in the GALL Report, the staff performed a full review to determine the adequacy of the AMPs. The staff evaluated the AMPs against the following 10 program elements defined in Appendix A to the SRP-LR.

(1) Scope of Program. The scope of 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. The parameters monitored or inspected should be linked to the degradation of the particular structure or component intended functions.

(4) Detection of Aging Effects. Detection of aging effects should occur before there is a loss of structure or component intended functions. This includes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection, and timing of new/one-time inspections to ensure timely detection of aging effects.

(5) Monitoring and Trending. Monitoring and trending should provide predictability of the extent of degradation and timely corrective or mitigative actions.

(6) Acceptance Criteria. The acceptance criteria, against which the need for corrective action is evaluated, should ensure that the structure or component intended functions 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. The 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 a formal review and approval process.

(10) Operating Experience. The 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 managed adequately so that the structure and component intended functions will be maintained during the period of extended operation.

The staff reviewed the applicant's Corrective Action Program and documented its findings in Section 3.0.4 of this SER. The staff's evaluation of the Corrective Action Program included assessment of the Corrective Actions, Confirmation Process, and Administrative Controls program elements. Consequently, the staff's documentation of its review of AMPs not consistent with the GALL Report only addresses 7 of the 10 program elements under Staff Evaluation sections of this SER in Sections 3.1 through 3.6.

The staff reviewed the information concerning the Operating Experience program element for the AMPs that are consistent with the GALL report, and documented its findings in the FNP Audit and Review Report.

The staff reviewed the final safety analysis review (FSAR) Supplement for each AMP to determine if it provided an adequate description of the program or activity, as required by 10 CFR 54.21(d).

3.0.2.2 Review of AMR Results

Table 2 includes all of the AMR information pertaining to FNP, Units 1 and 2, whether or not it aligns with the AMR information identified in the GALL Report. For a given AMR listed in Table 2, the staff reviewed the intended function, material, environment, AERM, and AMP combination for a particular component type within a system. The AMRs that correlate between a combination in Table 2 and a combination in the GALL Report were identified by a referenced item number in column 7, GALL Volume 2 Item. The staff conducted an audit to evaluate the correlation. A blank column 7 indicates that the applicant was unable to locate an appropriate corresponding combination in the GALL Report. The staff conducted a technical review of those combinations that were not consistent with the GALL Report. Column 8, Table 1 Item, provides a reference number that indicates the corresponding row in Table 1.

3.0.3 Aging Management Programs

The following Table 3.0.3-1 presents the AMPs credited by the applicant and described in Appendix B to the LRA. The table lists its AMP (if applicable) that the applicant has claimed is consistent with the GALL program, and the SSCs that credit the AMP for managing or monitoring aging. The table also provides the respective section of the SER in which the staff's evaluation of the program is documented.

Table 3.0.3-1 FNP Aging Management Programs

FNP AMP (LRA Section)	GALL Comparison	GALL AMP(s)	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Existing AMPs (B.3.0)				
Inservice Inspection Program (B.3.1)	Consistent	XI.M1 XI.M3 XI.M12 XI.S1 XI.S2 XI.S3 XI.S4	Reactor Vessel, Internals, and Reactor Coolant System; Containments, Structures, and Component Supports	3.0.3.1
Water Chemistry Control Program (B.3.2)	Consistent with one exception	XI.M2 XI.M21	Reactor Vessel, Internals, and Reactor Coolant System; Engineered Safety Features Systems; Auxiliary Systems; Steam and Power Conversion Systems; Containments, Structures, and Component Supports	3.0.3.2.1
Service Water Pond Dam Inspection Program (B.3.3)	Consistent	XI.S7	Containments, Structures, and Component Supports	3.0.3.1

FNP AMP (LRA Section)	GALL Comparison	GALL AMP(s)	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Reactor Vessel Surveillance Program (B.3.4)	Consistent with one exception	XI.M31	Reactor Vessel, Internals, and Reactor Coolant System	3.0.3.2.2
Borated Water Leakage Assessment and Evaluation Program (B.3.5)	Consistent	XI.M10	Reactor Vessel, Internals, and Reactor Coolant System; Engineered Safety Features Systems; Auxiliary Systems; Steam and Power Conversion Systems; Containments, Structures, and Component Supports	3.0.3.1.1
Overhead and Refueling Crane Inspection Program (B.3.6)	Consistent	XI.M23	Auxiliary Systems	3.0.3.1
Environmental Qualification Program (B.3.7)	Consistent	XI.EI	Electrical Components	3.0.3.1
Steam Generator Program (B.3.8)	Consistent	XI.M19	Reactor Vessel, Internals, and Reactor Coolant System	3.0.3.1.2
Enhanced AMPs (B.4.0)				
Flow-Accelerated Corrosion Program (B.4.1)	Consistent with enhancement	XI.M17	Steam and Power Conversion Systems	3.0.3.2.9
Fuel Oil Chemistry Control Program (B.4.2)	Consistent with exception and enhancement	XI.M30	Auxiliary Systems	3.0.3.2.3
Structural Monitoring Program (B.4.3)	Consistent with enhancement	XI.S5 XI.S6	Containments, Structures, and Component Supports, Auxiliary Systems	3.0.3.2.4
Service Water Program (B.4.4)	Consistent with enhancement	XI.M20	Auxiliary Systems; Steam and Power Conversion Systems	3.0.3.2.5
Fire Protection Program (B.4.5)	Consistent with enhancements	XI.M26 XI.M27	Auxiliary Systems; Containments, Structures, and Component Supports	3.0.3.2.6
New AMPs (B.5.0)				
Reactor Vessel Internals Program (B.5.1)	Consistent with exceptions	X1.M13 X1.M16	Reactor Vessel, Internals, and Reactor Coolant System	3.0.3.2.7
Flux Detector Thimble Inspection Program (B.5.2)	Plant specific	N/A	Reactor Vessel, Internals, and Reactor Coolant System	3.0.3.3.1

FNP AMP (LRA Section)	GALL Comparison	GALL AMP(s)	LRA Systems or Structures That Credit the AMP	Staff's SER Section
External Surface Monitoring Program (B.5.3)	Plant specific	N/A	Engineered Safety Features Systems; Auxiliary Systems; Steam and Power Conversion Systems; Electrical Components	3.0.3.3.2
Buried Piping and Tank Inspection Program (B.5.4)	Consistent with exceptions	XI.M34	Auxiliary Systems; Electrical Components	3.0.3.2.10
One-Time Inspection Program (B.5.5)	Consistent	XI.M32 XI.M33	Reactor Vessel, Internals, and Reactor Coolant System; Engineered Safety Features Systems; Auxiliary Systems; Steam and Power Conversion Systems	3.0.3.1
Non-EQ Cables Program (B.5.6): (1) Non-EQ Electrical Cables Used in Instrumentation Circuits (B.5.6.1)	1) Consistent with one exception	XI.E2	Electrical Components	3.0.3.2.8
(2) Non-EQ Electrical Cables Exposed to Adverse Localized Environments and Inaccessible Medium Voltage Cables (B.5.6.2)	2) Consistent	XI.E1 XI.E3	Electrical Components	3.0.3.1
Fatigue Monitoring Program (B.5.7)	Consistent	X.M1	Reactor Vessel, Internals, and Reactor Coolant System	3.0.3.1
NiCrFe Component Assessment Program (B.5.8)	Plant specific	N/A	Reactor Vessel, Internals, and Reactor Coolant System	3.0.3.3.3
Periodic Surveillance and Preventive Maintenance Activities Program (B.5.9)	Plant specific	N/A	Auxiliary Systems; Steam and Power Conversion Systems	3.0.3.3.4

3.0.3.1 AMPs That Are Consistent with the GALL Report

In Appendix B to the LRA, the applicant indicated that the following AMPs are consistent with the GALL Report:

- Inservice Inspection Program (B.3.1)
- Service Water Pond Dam Inspection Program (B.3.3)

- Borated Water Leakage Assessment and Evaluation Program (B.3.5)
- Overhead and Refueling Crane Inspection Program (B.3.6)
- Environmental Qualification Program (B.3.7)
- Steam Generator Program (B.3.8)
- One-Time Inspection Program (B.5.5)
- Non-EQ Electrical Cables Exposed to Adverse Localized Environments and Inaccessible Medium Voltage Cables (B.5.6.2)
- Fatigue Monitoring Program (B.5.7)

During its audit conducted November 3 to November 7, 2003, the staff reviewed selected documents and procedures associated with the AMPs that are listed above. The staff confirmed the applicant’s claim of consistency. The FNP Audit and Review Report documents details of the staff’s evaluation of the FNP audit and review. The staff determined that these AMPs are consistent with the AMPs described in the GALL Report.

The staff reviewed the operating experience associated with the AMPs that are listed above. With the exception of its review of the industry experience applicable to the applicant’s implementation of the Borated Water Leakage Assessment and Evaluation and Steam Generator Programs, the staff concludes that the applicant adequately considered the operating experience associated with the AMPs.

The Borated Water Leakage Assessment and Evaluation Program, as discussed in Section B.3.5 of Appendix B to the FNP LRA, is based on the applicant’s response to NRC Generic Letter (GL) 88-05, “Boric Acid Corrosion of Steel Reactor Pressure Boundary Components in PWR Plants,” dated May 31, 1988. However, a supplemental evaluation was necessary because recent, additional borated water leakage events have occurred in the industry that are relevant to the scope and implementation of this AMP. Section 3.0.3.1.1 of this SER provides the staff’s supplemental evaluation of the Borated Water Leakage Assessment and Evaluation Program.

The Steam Generator Program, as discussed in Section B.3.8 of Appendix B to the FNP LRA, is based on the applicant’s inspection program for steam generator (SG) tubes, as defined in the improved technical specifications (TS) for FNP, Units 1 and 2, and enhanced to conform to the inspection guidelines of NEI 97-06, “Steam Generator Program Guidelines,” issued in 1997. The supplemental evaluation in Section 3.0.3.1.2 of this SER discusses how the program attributes for the Steam Generator Program address its conformance with the guidelines of NEI 97-06.

In Appendix A to the LRA, the applicant provided the FSAR Supplement required by 10 CFR 54.21(d). The applicant stated that it will incorporate the information presented in Appendix A into Chapter 18 of the FSAR, following the issuance of the renewed operating licenses. The staff reviewed the information in Appendix A and evaluated that the FSAR Supplement provides an adequate summary of the program activities. The staff reviewed the following sections of Appendix A to the LRA:

- Section A.2.1 of the LRA for the Inservice Inspection Program

- Section A.2.3 of the LRA for the Service Water Pond Dam Inspection Program

- Section A.2.5 of the LRA for the Borated Water Leakage Assessment and Evaluation Program

- Section A.2.6 of the LRA for the Overhead Heavy and Refueling Crane Inspection Program

- Section A.2.7 of the LRA for the Steam Generator Program

- Section A.2.17 of the LRA for the One-Time Inspection Program

- Section A.2.19 of the LRA for Non-EQ Cables Program

- Section A.3.1 of the LRA for the Environmental Qualification Program

- Section A.3.2 of the LRA for the Fatigue Monitoring Program

The staff reviewed these sections and determined that the information in the FSAR Supplements provides an adequate summary of the program activities. The staff finds these sections of the FSAR Supplements sufficient.

On the basis of its audit and review, the staff concluded that those programs for which the applicant claimed consistency with the GALL Report are indeed consistent with the AMPs described in the GALL Report. The FNP Audit and Review Report documents the details of the staff's evaluation of the FNP audit and review.

3.0.3.1.1 Borated Water Leakage Assessment and Evaluation Program

Summary of Technical Information in the Application

The applicant summarized the Borated Water Leakage Assessment and Evaluation Program in Section B.3.5 of Appendix B to the FNP LRA. In Section B.3.5 of the LRA, the applicant stated that the AMP is used to manage loss of material in areas where carbon steel or low-alloy steel components may be susceptible to the effects of borated reactor coolant leaks. The applicant stated that this AMP is implemented in accordance with plant-specific commitments made in response to GL 88-05, and that it has given special attention to areas where insulated Class 1 bolted closures are located.

Staff Evaluation

Scope of the Program and Detection of Aging Effects

The applicant stated that the Borated Water Leakage Assessment and Evaluation Program is based on the applicant's response to GL 88-05, and that the AMP is entirely consistent with the program attributes of GALL AMP XI.M10, "Boric Acid Corrosion," without exception. The staff included the applicant's response to GL 88-05 within the scope of its review of this AMP.

In its response to GL 88-05, the applicant stated that it had a current plant-specific program at FNP for the identification, evaluation, and correction of leaks that could potentially occur in plant systems containing boric acid. This program (henceforth termed the GL 88-05 program) is the basis for the applicant's Borated Water Leakage Assessment and Evaluation Program discussed in Section B.3.5 of the LRA and consists of, as appropriate, inspections, evaluations, repairs, reviews of industry experience, and corrective actions, should leakage be detected. In its response to GL 88-05, the applicant also identified that the following welded connections and mechanical connections could be subject to leakage:

- reactor vessel head penetration canopy seal welds
- full-penetration welds on ASME Code Class 1 and 2 components
- pressurizer heater penetration welds
- manway covers
- reactor coolant pump main flange
- reactor coolant pump seal housing
- reactor vessel flange
- reactor vessel conoseal bolting
- valve body-to-bonnet connections
- valve packing
- flanged connections
- resistance temperature detectors

NRC Bulletins (BLs) 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," dated March 18, 2002, and 2003-02 and NRC Order EA-03-009 (both the original version and Revision 1 of the Order)document industry experience reported in American Society of Mechanical Engineers (ASME) Code Class 1 nickel-alloy, partial-penetration welds, including those used to join the upper reactor vessel (RV) head penetration nozzles to the upper RV heads and those used to join the bottom-mounted instrumentation (BMI) nozzles to the lower RV heads of pressurized-water reactors (PWRs). The staff requested additional clarification regarding the list of components that are within the scope of the Borated Water Leakage Assessment and Evaluation Program and the process the applicant uses to augment the list of in-scope components based on pertinent industry experience. Specifically, the staff requested the following actions of the applicant:

- Submit the list of component locations that are currently within the scope of the Borated Water Leakage Assessment and Evaluation Program and a discussion of the process used to augment ASME Code Class 1 and 2 component locations within the scope of the AMP, based on relevant industry experience.

- Discuss how SNC's responses to NRC BL 2002-01, dated March 29, 2002, and May 16, 2002; responses to the NRC's requests for additional information (RAIs) on the bulletin, dated January 17, 2003; response to NRC BL 2003-02, dated September 19, 2003; and responses to NRC Order EA-03-009, dated March 3, 2003, April 11, 2003, and April 18, 2003, have been used to update the list of component locations and types of visual inspections credited within the scope of the Borated Water Leakage Assessment and Evaluation Program or within the scope of other AMPs that provide for similar or more conservative types of inspections.

- If the responses were used to supplement the scope of the Borated Water Leakage Assessment and Evaluation Program or other AMPs, identify the component locations that have been added to the scope of the program and clarify the type of visual examinations (i.e., specify whether VT-1, VT-2 or VT-3 will be used and whether the visual examinations will be enhanced, bare-surface, qualified, etc.) that will be implemented on those components within the current scope of the program.

The staff identified these issues as within the scope of RAI B.3.5-1 (refer to NRC RAI dated March 17, 2004). The staff's evaluation of the Operating Experience program attribute further discusses the operating experience relevant to the Borated Water Leakage Assessment and Evaluation Program.

The applicant provided the following response to RAI B.3.5-1 in its letter dated April 16, 2004 (SNC Letter No. NL-04-0617):

> SNC's responses to the referenced NRC documents (bulletins and executive order) did not change component locations inspected under the Borated Water Leakage Assessment and Evaluation Program (BWLAEP) but did result in changes in inspection activities and leakage detection methods.
>
> The FNP responses to NRC Bulletins 2002-01 and 2002-02 provided summary information on the reactor pressure vessel (RPV) head inspections and maintenance activities at Plant Farley and information on the inspections performed at Alloy 600 and dissimilar metal Alloy 82/182 weld locations in the reactor coolant pressure boundary (RCPB). The FNP response to NRC Bulletin 2003-02 described inspection procedures, inspection results, and future plans for the inspection of RPV lower head penetrations and other Alloy 600 and Alloy 82/182 weld locations. These responses contained new, specific commitments (discussed in the following paragraphs) relative to RPV upper (top) and lower head examinations and reactor coolant pressure boundary leakage detection that are incorporated into the BWLAEP.
>
> FNP committed to perform a semi-annual sample and analysis of the containment atmosphere for iron concentration as a measure to assist in the detection of low levels of RCS leakage. FNP also committed to perform a best effort visual examination of the metal surface under the insulation of the RPV bottom head during the next refueling outage at each unit (U1R18 during Spring 2003 and U2R16 during Spring 2004). As stated in our response to NRC Bulletin 2003-02, the RPV bottom head inspections are a direct visual aided by remote devices and meet the intent of the MRP recommendations described in MRP 2003-017. The qualification standards for the visual examination procedures require resolution of the 0.105 inch lower-case character height which was taken from the EPRI Head Penetration report as applicable for lower head penetrations and has been the standard since the 1992 Edition of ASME for VT-3 examinations. The schedule and extent of subsequent inspections of the RPV bottom head will be determined pending results of the visual examinations of the outer surface of the bottom head, the results of the root cause analysis of the bottom-mounted instrumentation at South Texas Project Unit 1, and future industry experience.
>
> For the RPV top heads, FNP had committed to implementing the Electric Power Research Institute (EPRI) Materials Reliability Program (MRP) Inspection Plan on the existing RPV heads in addition to the existing ASME Section XI inspection requirements. Subsequently, the NRC has issued mandatory RPV head inspection requirements (Revised NRC Order EA-03-009) that now govern RPV top head inspections.
>
> Revised NRC Order EA-03-009 has established requirements for reactor pressure vessel (RPV) head penetration inspections that assign a susceptibility category to each RPV head related to PWSCC degradation. FNP has committed to replace the RPV upper heads prior to the period of extended operation (U1 is scheduled for Fall 2004 and U2 in Fall 2005), utilizing thermally-treated Alloy 690 based metal and Alloy 52/152 weld base metal for all closure head penetrations. Although the original FNP upper RPV heads fall into the" high" susceptibility category, the replacement RPV upper heads will fall into the "replaced" susceptibility category. Therefore, inspection requirements for the upper RPV heads will be reduced prior to FNP entering into the period of extended operation based on Revised NRC Order EA-03-009. Based on Paragraph IV.C(4) of the Revised NRC Order February 20, 2004 for the "replaced" RPV head category, no RPV head or head penetration nozzle inspections would be required during the refueling outage for which the RPV head was replaced. After that time, until the effective degradation year (EDY) value reaches eight, the reduced inspection requirements consist of the following:
>
> (i) A bare metal visual examination of 100% of the RPV head surface, including 360 degrees around each RPV head penetration nozzle every third refueling outage or five years

whichever comes first, and

(ii) A nonvisual NDE (ultrasonic, eddy current or dye penetrant tests) for each penetration every fourth refueling outage or seven years whichever comes first.

Currently, FNP is considered a “high” susceptibility plant that requires performance of the above inspections every refueling outage.

The applicant’s response to RAI B.3.5-1 dated April 16, 2004 (SNC Letter No. NL-04-0617) accomplishes three important aspects of the process used to augment the Borated Water Leakage Assessment and Evaluation Program:

(1) The response provides a detailed discussion that clarifies how the applicant applied pertinent industry boric acid leakage experience to modify the Program Scope and other program attributes for the Borated Water Leakage Assessment and Evaluation Program.

(2) The response confirms that the applicant has applied the industry experience summarized in NRC BLs 2002-01 and 2003-02 and NRC Order EA-03-009 to augment the inspection methods used for examining and monitoring for degradation and reactor coolant leakage from penetration nozzles adjoined to the FNP upper and lower RV heads.

(3) The response clarifies that the applicant considers nickel-alloy components (i.e., nickel-chromium-iron (NiCrFe)) to be susceptible locations and included them within the scope of the Borated Water Leakage Assessment and Evaluation Program.

Because the applicant’s response to RAI B.3.5-1 (1) clarifies how the applicant has applied pertinent industry experience to augment the scope of components within the Borated Water Leakage Assessment and Evaluation Program, (2) clarifies that nickel-alloy component locations are within the scope of the AMP, and (3) clarifies how the applicant has augmented the types of visual examination methods it uses for monitoring leakage from the upper and lower RV head penetration nozzles, the staff concludes that the applicant’s response to RAI B.3.5-1 is acceptable. RAI B.3.5.-1 is resolved.

<u>Preventive Actions, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria</u>

The applicant’s discussion in AMP B.3.5 indicates that it considers the Preventive Actions, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria to be consistent with the corresponding program attributes in GALL AMP XI.M10, “Boric Acid Corrosion,” without exception or deviation. Because the Preventive Actions, Parameters Monitored/Inspected, Detection of Aging Effects, Monitoring and Trending, and Acceptance Criteria program attributes for the Borated Water Leakage Assessment and Evaluation Program are consistent with the recommendations in the corresponding program attributes of GALL AMP XI.M10, the staff concludes that these program attributes for the Borated Water Leakage Assessment and Evaluation Program are acceptable.

<u>Operating Experience</u>

Significant industry experience exists that is relevant to the scope of the applicant’s Borated Water Leakage Assessment and Evaluation Program. NUREG/CR-5576, “Survey of Boric Acid

Corrosion of Carbon Steel Components in Nuclear Plants," dated January 1990, summarizes boric acid leakage and corrosion events that occurred in the industry before 1990. More recently, industry experience (refer to the operating events summarized in NRC BL 2002-01, NRC Executive Order EA-03-009, and NRC Regulatory Information Summary (RIS) 2003-13) has demonstrated that the nickel-alloy partial-penetration welds (Alloy 82/182 welds) used in the fabrication of upper RV head penetration nozzles may be susceptible to primary water stress-corrosion cracking (PWSCC) that could lead to leakage of the borated reactor coolant over time. In addition, the industry experience summarized in NRC BL 2003-02 demonstrates that the BMI nozzles of PWR-designed, light-water reactors may be susceptible to PWSCC that could lead to reactor coolant leakage. The staff included the applicant's responses to these bulletins and the executive order within the scope of its review of the AMP and issued RAI B.3.5-1 to address how the applicant incorporated this industry experience into the scope of the Borated Water Leakage Assessment and Evaluation Program. Since the issuance of RAI B.3.5-1, industry experience summarized in NRC BL 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized-Water Reactors," dated May 28, 2004, demonstrates that Alloy 600 base metal and Alloy 82/182 weld components used in pressurizer penetration nozzles and steam space piping connections may be susceptible to PWSCC and reactor coolant leakage.

In issuing RAI B.3.5-1, the staff inquired as to the process the applicant would use to augment the list of components within the scope of the Borated Water Leakage Assessment and Evaluation Program based on pertinent industry experience. This was done, in part, to account for any industry experience on borated water leakage events that could possibly impact the AMP between the time the applicant had responded to RAI B.3.5-1 in its letter dated April 16, 2004 (SNC Letter No. NL-04-0617) and the time of the pending issuance of the renewed operating licenses for the FNP units. Although the applicant's response to RAI B.3.5-1 was submitted before the staff issued NRC BL 2004-01, the applicant confirmed that it is updating the list of components within the scope of the Borated Water Leakage Assessment and Evaluation Program based on reactor coolant leakage events within the industry. Further, the applicant has included ASME Code Class 1 Alloy 600 base metal and Alloy 82/182 weld components within the scope of the Borated Water Leakage Assessment and Evaluation Program. This includes any ASME Code Class 1 Alloy 600 base metal and Alloy 82/182 weld metal components in the pressurizer system.

The staff and the industry are currently pursuing resolution of the issues raised and discussed in NRC BL 2004-01 regarding PWSCC and reactor coolant leakage in pressurizer penetrations and steam space piping connections. Because this is an emerging issue that has yet to be resolved, but will be during the current operating term for the FNP units, consideration of these issues is beyond the scope of this license renewal review, pursuant to 10 CFR 54.30(b).

Based on this assessment, the staff concludes that the Operating Experience program attribute is acceptable because the applicant is applying pertinent generic communications on borated reactor coolant leakage events as the basis for augmenting the scope of the Borated Water Leakage Assessment and Evaluation Program. In addition, the applicant updated the Scope program attribute for the Borated Water Leakage Assessment and Evaluation Program to include ASME Code Class 1 Alloy 600 base metal and Alloy 82/182 weld metal components.

<u>FSAR Supplement</u>

The applicant provided the following FSAR Supplement summary description for the Borated Water Leakage Assessment and Evaluation Program in Section A.2.5 of Appendix A to the LRA:

> The Borated Water Leakage Assessment and Evaluation program implements the plant-specific commitments made in response to NRC Generic Letter 88-05. The program is applicable to areas where there are carbon steel and low-alloy steel structures or components, or electrical components, on which borated reactor water might leak. This program is consistent with the 10 attributes of the aging management program described in NUREG-1801, Section XI.M10.

The applicant's FSAR Supplement summary description for the Borated Water Leakage Assessment and Evaluation Program provides a general reference to commitments made in the applicant's response to GL 88-05. The staff requested that the applicant amend the FSAR Supplement summary description to provide more specific references to its response to GL 88-05 and to any additional responses to NRC generic communications (i.e., GLs, BLs, orders, or circular letters) that are germane to the Scope or other program attributes for the AMP, or have been used to amend the program attributes for the AMP, including those responses to NRC BL 2002-01 and 2003-02 and to NRC Order EA-03-009, as appropriate. The staff issued these requests in RAI B.3.5-2.

The applicant provided the following response to RAI B.3.5-2 in its letter dated April 16, 2004 (SNC Letter No. NL-04-0617):

> Providing specific references to FNP responses to NRC generic communications that are germane to the Borated Water Leakage Assessment and Evaluation Program (BWLAEP) would be unwieldy and inconsistent with the level-of-detail presented in the FSAR, and is unnecessary. The FNP-specific responses to NRC communications are readily retrievable in the NRC Public Document Room. References to applicable NRC generic communications are incorporated into the program governing documents as appropriate.
>
> To address the NRC's concern, SNC will revise the FSAR Supplement description in Appendix A.2.5, Borated Water Leakage Assessment and Evaluation Program as follows (changes indicated by ***bold italics***):
>
> "The Borated Water Leakage Assessment and Evaluation program implements the plant-specific commitments made in response to NRC Generic Letter 88-05 ***and subsequent NRC communications on boric acid corrosion and leakage detection which include NRC Bulletins 2001-01, 2002-01, 2002-02, 2003-02, and NRC Order EA-03-009 (as revised)***. The program is applicable to areas where there are carbon steel and low-alloy steel structures or components, or electrical components, on which borated reactor water might leak.
>
> This program is consistent with the 10 attributes of the aging management program described in NUREG-1801, Section XI.M10."

The staff issued RAI B.3.5-2 to assure that the applicant's discussion in its FSAR Supplement summary description for the Borated Water Leakage Assessment and Evaluation Program was consistent with relevant NRC generic communications and the CLB for the plants. The applicant's response to RAI B.3.5-2 indicates that the applicant has amended the FSAR Supplement summary description for the Borated Water Leakage Assessment and Evaluation Program to include the applicant's responses and commitments made in reference to NRC BLs 2001-01, 2002-01, 2002-02, 2003-02, and NRC Order EA-03-009, as amended by the applicant's response to the first revision of the Order. The staff concludes that the FSAR Supplement summary description for the Borated Water Leakage Assessment and Evaluation

Program, as amended by the applicant's response to RAI B.3.5-2, is acceptable because the summary description is current with the CLB for the facilities and references SNC's responses and commitments to NRC generic communications that are relevant to the scope and implementation of the AMP. RAI B.3.5-2 is closed.

Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that, for the Borated Water Leakage Assessment and Evaluation Program, 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 reviewed the associated FSAR Supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Steam Generator Program

The applicant described its Steam Generator Program in Appendix B.3.8 to the LRA. This is an existing program. The applicant stated that the program is based upon NEI 97-06, which provides for detecting flaws in tubing and secondary-side internals degradation. The applicant uses the program to perform SG surveillance in accordance with the TS. The applicant also stated that its program is consistent with GALL AMP Section XI.M19 with no exceptions.

The staff reviewed the applicant's description of the program in Appendix B.3.8 to the LRA to determine whether the applicant has demonstrated that the program will adequately manage the applicable aging effects in the FNP's steam generators during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Summary of Technical Information in the Application

The applicant replaced its original Westinghouse Model 51 steam generators with Westinghouse Model 54F replacement SGs. The Units 1 and 2 replacement steam generators were installed in May 2000 and May 2001, respectively. The applicant's replacement SGs incorporate several improvements over the original Model 51 steam generators, including thermally treated Alloy 690 tubes, stainless steel tube support plates, and stainless steel antivibration bars. The applicant stated that the only indication of tube degradation of Alloy 690 thermally treated tubes has been wear related, either as a result of loose parts or at tube support structures. The applicant further stated that it will update its Steam Generator Program as required to incorporate changes to NEI 97-06 and the associated Electric Power Research Institute (EPRI) guidelines for steam generators.

Staff Evaluation

The first inservice inspection (ISI) of the applicant's Unit 1 replacement SGs was conducted during the U1R16 outage in Fall 2001. The inspection consisted of 100 percent eddy current testing (ECT), with a bobbin probe, of all inservice tubes over their full length in all three Unit 1 steam generators. A rotating pancake coil probe equipped with a +Point™ probe was used to inspect 100 percent of the low row (rows 1 and 2) U-bends, 20 percent of the hot-leg top-of-tubesheet region, and all bobbin signals that indicated a change since the preservice inspection or that were newly found during the U1R16 outage. The inspection detected no evidence of axial or circumferential crack-like indications, wear, or service-induced reduction in wall thickness, and no tubes were plugged. The first ISI of the SGs in Unit 2 was scheduled for Spring 2004. The results of the inspection were consistent with those that have been observed in other plants during their first ISI, namely that wear was the only form of active degradation.

In Appendix B.3.8 to the LRA, the applicant stated that the Steam Generator Program is based upon NEI 97-06, which includes an assessment of degradation mechanisms and considers operating experience from similar SGs to identify degradation mechanisms. For each mechanism, the EPRI guidelines associated with NEI 97-06 define the inspection techniques, measurement uncertainty, and the sampling strategy. The EPRI guidelines associated with NEI 97-06 provide criteria for the qualification of personnel, specific techniques, and the associated acquisition and analysis of data. This includes procedures, probe selection, analysis protocols, and reporting criteria. The performance criteria in NEI 97-06 pertain to structural integrity, accident-induced leakage, and operational leakage. A steam generator program, as defined in NEI 97-06, includes guidance on assessing degradation mechanisms, inspection, tube integrity assessment, maintenance, plugging, repair, leakage monitoring, and procedures for monitoring and controlling secondary-side and primary-side water chemistry. The applicant's Water Chemistry Control Program, based on EPRI's water chemistry guidelines for PWRs, relies on monitoring and control of reactor water chemistry and secondary water chemistry. The applicant stated in Appendix B.3.8 that it will update its Steam Generator Program, as required, to incorporate changes to NEI 97-06 and the EPRI guidelines for steam generators.

In Appendix B.3.8 to the LRA, the applicant stated that the Steam Generator Program is consistent with GALL AMP XI.M19, "Steam Generator Tube Integrity," which is an AMP credited for managing the aging effects of the SG tubes and tube plugs. GALL AMP XI.M19 recommends preventive measures for mitigation of degradation phenomena, assessment of degradation mechanisms, conduct of inservice inspection of SG tubes to detect degradation, evaluation and plugging or repair, and monitoring of leakage to maintain the structural and leakage integrity of the pressure boundary. The applicant credited the Steam Generator Program to manage the aging effects of secondary-side internals, which are listed in LRA Table 3.1.2-4. The applicant noted no deviations or enhancements. The staff was unclear as to how the applicant manages the SG secondary-side internals. By letter dated March 22, 2004, in RAI 3.1.2.4-5, the staff requested that the applicant confirm that the Steam Generator Program contains the 10 elements in its plant-specific program for managing the aging effects of the secondary-side internals.

In its response to RAI 3.1.2.4-5 dated April 22, 2004 (SNC Letter No. NL-04-0678), the applicant responded that the scope of the Steam Generator Program includes activities to detect degradation of SG components, the failure of which could impact tubing integrity. Hence, the applicant's Steam Generator Program is consistent with the guidelines of NEI 97-06 and GALL AMP X1.M.19. NEI 97-06 includes monitoring of secondary-side SG components if their failure could prevent the SG from fulfilling its intended safety-related function. The applicant went on to list the secondary-side internals (also listed in LRA Table 3.1.2-4) for which its program is credited for the management of degradation. The staff finds that the scope of the applicant's Steam Generator Program is appropriate because it is credited with the management of the secondary-side internals.

With regard to the preventive actions in its program, the applicant stated that while the replacement SGs include several design and materials improvements, they are not preventive measures of the Steam Generator Program. Consistent with NEI 97-06 and GALL AMP XI.M19, the applicant's Steam Generator Program relies upon water chemistry controls to prevent or mitigate initiation of degradation mechanisms or reduce the rate of degradation. The applicant implements these primary- and secondary-side chemistry controls as part of the Water Chemistry Control Program. The staff finds that this program is a condition or performance monitoring program because it does not rely on preventive actions. Therefore, no preventive actions are associated with this program. In addition, the staff concludes that the program relies on the Water Chemistry Control Program to prevent or mitigate the initiation of or reduce the rate of degradation.

With regard to parameters monitored or inspected in its program, the applicant stated that the Steam Generator Program includes inspection activities intended to detect degradation of the secondary-side internals needed to maintain tubing integrity and accomplishment of the SG intended safety-related functions. An assessment based upon SG design, potential degradation mechanisms, and related FNP and industry operating experience is performed to establish inspection requirements for secondary-side internals components. The resulting inspection requirements are incorporated into the SG inspection plans. The staff concludes, that because the applicant's program utilizes inspection activities which are based on factors such as the design/construction of the replacement SGs, degradation mechanisms, and industry operating experience, the Steam Generator Program will monitor the parameters necessary to mitigate and prevent degradation of the secondary-side internals.

With regard to the detection of aging effects by its program, the applicant stated that SG tubing ECT data provide some indication of secondary-side conditions (e.g., evidence of loose parts). However, detection of aging effects in the SG secondary-side internals is primarily accomplished through the use of visual inspections. The applicant considered industry and FNP-specific operating experience resulting from prior inspections and cleaning activities (e.g., sludge lancing, sludge collector cleaning, etc.) in establishing secondary-side inspection requirements. Inspections of SG secondary-side components are performed as needed to assess conditions or evaluate potential degradation mechanisms. Visual inspections are adequate to detect loss of material and cracking of SG internal support structures before any detrimental impact on tube integrity. Various tools and techniques are available for visual inspection of secondary-side components. The staff concludes that, because the applicant conducts periodic visual inspections, eddy current inspections of the SG tubes, and various cleaning activities, the Steam Generator Program will detect aging of secondary-side internals before there is a loss of structure or intended component function.

With regard to monitoring and trending in its program, the applicant stated that, consistent with NEI 97-06, secondary-side SG components, whose failure could prevent the SG from fulfilling its intended safety-related function, shall be monitored. NEI 97-06 states, "The monitoring shall include design reviews, an assessment of potential degradation mechanisms, industry experience for applicability, and inspections, as necessary, to ensure degradation of these components does not threaten tube structural integrity and leakage integrity of the ability of the plant to achieve and maintain safe shutdown." Inspection requirements are based upon the results of an assessment which considers SG design, potential degradation mechanisms, and related FNP and industry operating experience. Inspection results are documented and, when applicable, trends are used to alter the inspection requirements for subsequent inspections. The staff notes that the applicant performs monitoring activities, which are based on an assessment that considers replacement SG design, potential degradation mechanisms, and

FNP and industry operating experience. In addition, the staff notes that the applicant performs trending, when applicable, to alter inspection requirements for subsequent inspections. Therefore, the staff concludes that the applicant's Steam Generator Program incorporates monitoring and trending activities will manage the degradation of secondary-side internals.

With regard to acceptance criteria in its program, the applicant stated that the acceptance criteria for inspections of secondary-side components are based on the inspection method and engineering evaluation. Visual inspections typically use qualitative criteria for identifying degradation sufficient to warrant further evaluation. Further evaluation may involve additional inspection and engineering evaluation to quantify the amount of degradation (e.g., ultrasonic testing to determine actual wall thickness and engineering evaluation to compare the results to the design requirements). Corrective actions can include followup inspections to assess the rate of degradation or repair/replacement of the degraded component, or other actions as deemed appropriate. When test or inspection results do not satisfy established acceptance criteria, the applicant initiates corrective actions using a condition report. The staff concludes that the applicant uses qualitative inspections, such as visual, to ascertain whether quantitative inspections or engineering evaluations are warranted to identify and compare the degradation to established acceptance criteria. Therefore, the staff concludes that the applicant's Steam Generator Program incorporates the acceptance criteria and that the structure and component intended functions of the secondary-side internals are and will be maintained.

Section 3.0.4 of this SER addresses the Corrective Actions, Confirmation Process, and Administrative Controls program attributes in their entirety.

With regard to operating experience, the applicant stated that its replacement SGs are Westinghouse Model 54F with significant design and material improvements, as compared to the original Westinghouse Model 51 SGs. To date, the applicant has not identified any degradation of the Model 54F replacement SG secondary-side components. In addition, SNC is not aware of any degradation of similar model replacement SGs within the industry. A review of generic communications issued since NUREG-1801 did not identify any applicable degradation issues. The applicant's Steam Generator Program is a mature program with significant operating experience, and was successfully used to manage SG degradation of secondary-side internals in the original Model 51 SGs. The staff finds that the applicant's operating experience with the recently replaced SGs shows no applicable degradation issues, and that sufficient evidence exists to support the conclusion that the structure and component intended functions of the secondary-side internals will be maintained during the period of extended operation.

On the basis of the information submitted, the staff finds that the applicant's Steam Generator Program is adequate to manage the effects of aging of the SG secondary-side internals in the FNP steam generators.

FSAR Supplement

The applicant's FSAR Supplement states that the Steam Generator Program, which is based on NEI 97-06 and used to perform tube surveillance, is consistent with the TS. The applicant also stated that the Steam Generator Program is consistent with the 10 attributes of the GALL AMP XI.M19. However, the FSAR does not describe the management of the aging effects of the SG secondary-side internals. By letter dated March 22, 2004, in RAI 3.1.2.4-6, the staff requested that the applicant state in the FSAR that the aging effects of the SG secondary-side internals will be managed in a manner consistent with the attributes described in RAI 3.1.2.4-5.

In its response to RAI 3.1.2.4-6 dated April 22, 2004 (SNC Letter No. NL-04-0678), the applicant responded by stating that it will revise Section A.2.7 of the FSAR Supplement as follows (changes indicated by ***bold italics***):

> **A.2.7 STEAM GENERATOR PROGRAM**
>
> The Steam Generator Program used to perform replacement steam generator tube surveillance in accordance with the Technical Specifications will be continued during the period of extended operation. ***The program includes monitoring of steam generator secondary side internal components whose failure could prevent the steam generator from fulfilling its intended safety-related function.*** This program will be based upon NEI 97-06, "Steam Generator Program Guidelines" or its successors.

The staff finds the revised FSAR Supplement acceptable because it includes a description of how the Steam Generator Program will manage the secondary-side internals, consistent with the applicant's response and the GALL Report.

Conclusion

On the basis of its review and audit of the applicant's program, the staff finds that the applicant has demonstrated that the Steam Generator Program will effectively manage aging in the SG components for which this program is credited and will ensure that the SGs will perform their intended function in accordance with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff reviewed the associated FSAR Supplement for this AMP and concludes that the FSAR Supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 Summary of Conclusion for AMPs That Are Consistent with the GALL Report

On the basis of its review and audit of the applicant's AMPs, the staff concludes that for the AMPs listed above, 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 reviewed the associated FSAR Supplement for these AMPs and concludes that the FSAR Supplement provides an adequate summary description of the programs, as required by 10 CFR 54.21(d).

3.0.3.2 AMPs That Are Consistent with the GALL Report, but with Exceptions and/or Enhancements

In Appendix B to the LRA, the applicant indicated that the following AMPs were consistent with the GALL Report with exceptions and/or enhancements:

- Water Chemistry Control Program (B.3.2)
- Reactor Vessel Surveillance Program (B.3.4)
- Fuel Oil Chemistry Control Program (B.4.2)
- Structural Monitoring Program (B.4.3)
- Service Water Program (B.4.4)
- Fire Protection Program (B.4.5)

- Reactor Vessel Internals Program (B.5.1)
- Non-EQ Electrical Cables Used in Instrumentation Circuits Program (B.5.6.1)
- Flow-Accelerated Corrosion Program (B.4.1)
- Buried Piping and Tank Inspection Program (B.5.4)

For AMPs that the applicant claimed to be consistent with the GALL Report with exceptions and/or enhancements, the staff performed an audit to determine that those attributes or features of the program for which the applicant claimed consistency with the GALL Report were indeed consistent. Furthermore, the staff reviewed the exceptions and/or enhancement and the applicant's justification to determine whether each AMP, with its exception and/or enhancement, remains adequate to manage the aging effects for which it is credited. The FNP Audit and Review Report documents details of the staff's evaluation of the FNP audit and review. The staff also reviewed the applicant's exceptions and/or enhancements to the GALL Report to determine whether they are acceptable. The following sections of this SER document the results of the staff's audit and review.

3.0.3.2.1 Water Chemistry Control Program

Summary of Technical Information in the Application

Section B.3.2, "Water Chemistry Control Program," of Appendix B to the LRA describes the applicant's Water Chemistry Control Program. The applicant stated that the Water Chemistry Control Program is an existing program that is consistent with GALL AMP XI.M2, "Water Chemistry," for primary and secondary water chemistry control, and is consistent with GALL AMP XI.M21, "Closed-Cycle Cooling Water System," with an exception for closed cooling water chemistry control.

The applicant stated that the Water Chemistry Control Program will manage loss of material and cracking within system components and structures, thereby ensuring continued structural integrity, reliability, and availability. The program includes monitoring of detrimental species and addition of chemical additives. The program utilizes the EPRI water chemistry guidelines in establishing chemistry control procedures for FNP. These documents are updated as necessary to reflect improved guidance and industry experience.

Staff Evaluation

During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The FNP Audit and Review Report documents details of the staff's evaluation of the FNP audit and review. Furthermore, the staff reviewed the exception and its justification to determine whether the AMP, with the exception, remains adequate to manage the aging effects for which it is credited.

In Section B.3.2 of Appendix B to the LRA, the applicant stated that the Water Chemistry Control Program for the closed-cycle cooling water (CCCW) systems and emergency diesel generator (EDG) jacket cooling water is consistent with GALL Report AMP XI.M21, with one exception. With respect to the Water Chemistry Control Program for the CCCW systems, the applicant takes exception to GALL performance testing for pumps and heat exchangers, choosing to utilize the EPRI monitoring guidelines instead. The applicant also credited a focused, one-time inspection (using its One-Time Inspection Program) to validate the Water

Chemistry Control Program in low-flow and stagnant areas.

The staff reviewed the component cooling water (CCW) pump surveillance test results, the heat exchangers condition report history since 1989, and the mechanical operating experience report for the CCCW system. The staff concluded that the applicant's proposed exception is acceptable on the basis that (1) the CCW pumps and heat exchangers have not experienced any significant age-related failure, and (2) aging effects in the CCW can be monitored and controlled by water chemistry control and corrosion inspection for components in systems treated with corrosion-inhibiting material.

The staff reviewed the One-Time Inspection Program. The staff concludes that using a one-time inspection (via the One-Time Inspection Program) to validate the Water Chemistry Control Program in low-flow and stagnant areas is acceptable.

On the basis of its review of this AMP, the associated program master document, the relevant station administrative procedure, and a sample of implementing procedures, the staff determined that the Water Chemistry Control Program is consistent with the GALL Report, and that the exception in the Water Chemistry Control Program is acceptable.

Operating Experience

The applicant stated that the Water Chemistry Control Program incorporates the best practices of industry organizations, vendors, and utilities. The staff noted that most of the plant-specific condition reports reviewed by the applicant dealt with relatively minor instances of chemistry parameters outside of specified limits, and that prompt corrective actions were taken to restore water chemistry parameters within acceptable limits. In addition, the staff noted that the applicant has incorporated the results of self-assessments into its Water Chemistry Control Program, resulting in improvements in the program's chemical treatment methods, visual inspection planning, and trending capabilities.

The staff finds that the applicant has aggressively pursued improvements in aging management of in-scope components through improved chemical control methods, sampling and measurement techniques, and installation of new equipment designed to mitigate aging effects. The applicant has based its improvements on EPRI TR-105714, "PWR Primary Water Chemistry Guidelines," dated January 1999. One improvement the applicant implemented was to use materials more resistant to PWSCC in the replacement SGs. The applicant made program changes to optimize chemistry control during startup/shutdown and to minimize entry of contaminants into the primary water from makeup water sources, including the spent fuel pool. The addition of zinc to reactor coolant, based on a recommendation in EPRI-TR-105714, tends to reduce the potential for PWSCC and out-of-core shutdown dose rates.

Based on its review of the above operating experience, the staff concludes that the Water Chemistry Control Program adequately manages the aging effects that have been observed at the applicant's plant.

FSAR Supplement

In Appendix A.2.2 to the LRA, the applicant provided the FSAR Supplement for the Water Chemistry Control Program. The staff reviewed this section and determined that the information in the FSAR Supplement provides an adequate summary of the program activities. The staff finds this section of the FSAR Supplement sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. In addition, the staff reviewed the exceptions to the GALL Report program and finds 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Reactor Vessel Surveillance Program

Appendix H to 10 CFR Part 50 specifies the NRC requirements for reactor vessel materials surveillance programs, which provide the regulatory bases for the applicant's Reactor Vessel Surveillance Program for FNP, Units 1 and 2.

Summary of Technical Information in the Application

The applicant described the Reactor Vessel Surveillance Program in Section B.3.4 of the LRA. In this section of the LRA, the applicant stated that the Reactor Vessel Surveillance Program is a condition monitoring program which predicts changes in reactor vessel beltline material fracture toughness. The program also evaluates neutron embrittlement through surveillance capsule testing and evaluation, fluence calculations and benchmarking, and monitoring of effective full-power years (EFPYs). The applicant stated that the AMP applies the calculational methodology of Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," dated March 2001, for fluence calculations and determinations. This RG provides the NRC guidelines for performing "best estimate" fluence calculations.

Staff Evaluation

The staff's evaluation of the Reactor Vessel Surveillance Program is based on its review of the program description in LRA Section B.3.4, as supported by pertinent information documented in the staff's FNP Audit and Review Report. The staff's criteria for accepting the Reactor Vessel Surveillance Program are based on both conformance with GALL AMP XI.M31 and compliance with the applicable requirements of Appendix H to 10 CFR Part 50.

The applicant stated that its Reactor Vessel Surveillance Program is consistent with GALL AMP XI.M31 with the following exception:

> The singular exception to the eight (8) acceptable program items described in NUREG-1801 relates to SNC's proposed surveillance capsule removal schedule. NUREG-1801 specifies that all remaining surveillance capsules are to be removed at a 60-year fluence and alternate dosimetry installed. For FNP Unit 1, SNC has removed one capsule at a fluence approximately equivalent to 60 years. For FNP Unit 2, SNC will remove one capsule at a fluence approximately equivalent to 60 years. For each unit, one capsule will remain in the reactor vessel until a fluence of

approximately 80-years.

The program discussion in GALL AMP XI.M31 is not currently based on the staff's recommendations of the 10 program attributes that should be included within the scope of an RV materials surveillance program, but rather on general recommendations of how an RV materials surveillance program is expected to comply with the requirements of Appendix H to 10 CFR Part 50. The program should be modified, as applicable, to address the increases in neutron fluences projected for the period of extended operation. Because the applicant considered the Reactor Vessel Surveillance Program to be an existing plant-specific program for FNP, Units 1 and 2, it included a description of the 10 program elements in Section B.3.4 of the LRA. The staff included its evaluation of the Corrective Actions, Administrative Controls, and Confirmation Process program attributes for the FNP Reactor Vessel Surveillance Program within the scope of its assessment of the Quality Assurance Program for the application. The following paragraphs discuss the staff's evaluation of the remaining program attributes for the FNP Reactor Vessel Surveillance Program. The evaluation of the applicant's exception to GALL AMP XI.M31 is discussed within the Monitoring and Trending program attribute.

[Scope of Program] Reactor vessel materials surveillance programs, which are designed and implemented in accordance with Appendix H to 10 CFR Part 50, use testing on RV surveillance capsule test specimens as the basis for monitoring neutron irradiation-induced embrittlement in base metals (plates or forgings) and welds that are used to fabricate low-alloy steel fabricated RVs. The applicant stated that the scope of the Reactor Vessel Surveillance Program encompasses all reactor vessel beltline materials, including the RV lower and intermediate shell plates, longitudinal welds, and circumferential welds.

Appendix H to 10 CFR Part 50 provides the following purpose for RV surveillance programs:

> The purpose of the materials surveillance program required by this appendix is to monitor for changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline region of light water nuclear power reactors which result from exposure of these materials to neutron irradiation and the thermal environment. Under the program, fracture toughness test data are obtained from material specimens exposed in surveillance capsules, which are withdrawn periodically from the reactor vessel.

The base metal (i.e., either plate or forging materials) and weld materials in surveillance capsule test specimens are generally representative of the base metal and weld materials that are located in the beltline region of the RV. Therefore, the RV components identified by the applicant as being within the scope of the Reactor Vessel Surveillance Program for FNP, Units 1 and 2, are consistent with those that are within the scope of Appendix H to 10 CFR Part 50. The staff therefore concludes that the scope of the applicant's AMP is acceptable.

[Preventive Actions] The applicant stated that the Reactor Vessel Surveillance Program for FNP, Units 1 and 2, is a condition monitoring program. Therefore, no preventive or mitigative actions are associated with this AMP. Reactor vessel materials surveillance programs use RV surveillance capsule test specimens as the basis for monitoring neutron irradiation-induced embrittlement in the RV beltline base metal (plates and forgings) and weld materials. The staff concurs that the Reactor Vessel Surveillance Program for FNP, Units 1 and 2, is a condition monitoring program for the beltline base metal and weld materials in the RV shells, and therefore does not include preventive or mitigative strategies. The staff concludes that the applicant's Preventive Actions program attribute is acceptable.

[Parameters Inspected or Monitored] and [Detection of Aging Effects] The applicant stated that the objective of the Reactor Vessel Surveillance Program is to periodically monitor and project reductions in the fracture toughness of RV beltline materials. This is consistent with Section I of Appendix H to 10 CFR Part 50 and is acceptable. The applicant also stated that the reductions in fracture toughness due to neutron embrittlement are manifested as a reduction of the upper-shelf energy (USE) and an increase in the nil ductility reference temperature (RT_{NDT}). Changes in these properties will also result in changes to the predicted pressurized thermal shock (PTS) reference temperature (RT_{PTS}) values and pressure-temperature (P-T) limit values. The applicant stated that the Reactor Vessel Surveillance Program for FNP, Units 1 and 2, detect and project reductions in RV beltline material fracture toughness, such that no loss of the RV intended functions occurs.

The applicant's Parameters Inspected or Monitored and Detection of Aging Effects program attributes for the FNP Reactor Vessel Surveillance Program address the impact that the RV surveillance data (including neutron fluence dosimetry data, Charpy-V notch impact data, tensile test, and alloying chemistry data, as obtained through implementation of the AMPs) will have on fracture toughness properties assessed in the time-limited aging analyses (TLAAs) for neutron irradiation embrittlement (refer to Chapter 4.2 of the LRA and Section 4.2 of this SER). These TLAAs include the TLAAs on USE, adjusted reference temperature calculations (RT_{NDT} calculations), and P-T limit calculation assessments (as required under the provisions of Appendix G to 10 CFR Part 50), as well as the TLAA for calculating RT_{PTS} values, which is required for PTS assessments (refer to the requirements of 10 CFR 50.61). The program attribute descriptions also appropriately identify how the applicant will use the changes in the fracture toughness properties and parameters, as monitored through implementation of the program, to assure that the structural integrity of the RV and other reactor coolant pressure boundary (RCPB) components is maintained. Based on this assessment, the staff concludes that the Parameters Inspected or Monitored and Detection of Aging Effects program attributes are acceptable.

[Monitoring and Trending] The applicant stated that the Reactor Vessel Surveillance Program monitors and trends predicted changes in vessel beltline material fracture toughness properties, and that it performs a reevaluation whenever new surveillance capsule data become available or when changes in operating parameters occur that may affect end-of-license predictions of fracture toughness. The applicant also indicated that the EFPYs for the reactor units are also monitored.

During implementation of RV materials surveillance programs, the monitoring and trending of fracture toughness properties is accomplished by the periodic removal and testing of surveillance capsules during the operating periods for the reactors. Appendix H to 10 CFR Part 50 requires the implementation of surveillance capsule withdrawal schedules to conform to the surveillance capsule removal criteria of American Society for Testing and Materials (ASTM) Standard Practice E185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," dated 1982. The staff considers the edition of ASTM E185 in effect at the time the RV was purchased to be acceptable, or any subsequent edition through the 1982 edition (ASTM E185-82) of the standard. Appendix H to 10 CFR Part 50 also requires the applicant to submit proposed withdrawal schedules for NRC staff review and approval.

The applicant took one exception to the provisions in GALL AMP XI.M31 and indicated that the

GALL program recommended that all remaining surveillance capsules be removed at a 60-year fluence and alternate dosimetry installed. The applicant stated that instead of meeting this recommendation, for FNP, Unit 1, SNC has removed one capsule at a fluence approximately equivalent to the peak RV fluence at 60 years of operation. For FNP, Unit 2, the applicant stated that SNC will remove one capsule at a fluence approximately equivalent to the peak RV fluence at 60 years of operation. The applicant also stated that one additional capsule will remain in each of the RVs until each capsule receives an accumulated fluence equivalent to the peak RV fluence for the reactor unit at approximately 80 years of operation. On February 23, 2004, as supplemented by its letter of March 5, 2004, SNC requested staff review and approval of the changes to the Reactor Vessel Surveillance Program withdrawal schedules for FNP, Units 1 and 2, to support operation through 60 years of licensed operation (i.e., through 54 EFPYs). The applicant's letters of February 23, 2004, and March 5, 2004, address the identity of the capsules referred to in the applicant's exception and the specific details of the times of removal and neutron fluence values for these capsules.

In its safety evaluation of March 15, 2004, the staff determined that, to accommodate license extension, the schedules for the removal of Capsules V and Z from the FNP Unit 1 RV and Capsules Y and V from the FNP Unit 2 RV conform to ASTM E185-82, if the criteria in the standard are applied to the period of extended operation (60 years of licensed operation, or 54 EFPYs, in this case). Provision 6 of GALL AMP XI.M31 recommends that at least one capsule be removed at a time when the fluence for the capsule is expected to be approximately equivalent to the projected peak RV neutron fluence at 60 years of operation. The applicant's withdrawal of Capsule V from FNP, Unit 1, was performed when the accumulated fluence for the capsule was equivalent to the projected peak RV neutron fluence for FNP, Unit 1, at 54 EFPYs. The applicant's withdrawal of Capsule Y from FNP, Unit 2, is to be performed when the accumulated fluence for the capsule is approximately equivalent to the projected peak RV neutron fluence for FNP, Unit 2, at 54 EFPYs. The applicant's withdrawal of Capsule V from the FNP Unit 1 RV, and the projected withdrawal of Capsule Y from the FNP Unit 2 RV, conform to the criteria in provision 6 of GALL AMP XI.M31 and are acceptable.

FNP Unit 1 Capsule Z and FNP Unit 2 Capsule V are supplemental in-vessel capsules that are available for removal and testing to demonstrate operation beyond 60 years of licensed operation. For plants with high lead factors (i.e., lead factors of approximately 3.0 or greater), GALL AMP XI.M31 recommends that any remaining (supplemental) capsules in the RV be removed and placed into storage for reinsertion at a later time. This will prevent overexposure of the surveillance capsules before their removal, should an additional period of extended operation be requested. The applicant has taken an exception to this provision. Instead, the applicant has stated that the FNP Unit 1 Capsule Z and the FNP Unit 2 Capsule V will remain in the RVs, and that the capsules will be removed at the time when the neutron fluences for the capsules are expected to correspond to the projected peak RV neutron fluence at 80 years of operation for each unit.

In its letter dated March 5, 2004, the applicant provided its proposed withdrawal times and projected neutron fluence values for FNP Unit 1 Capsule Z and FNP Unit 2 Capsule V. The staff evaluated whether the projected neutron fluences and withdrawal times for FNP Unit 1 Capsule Z and FNP Unit 2 Capsule V will provide relevant data for 80 years of operation. Since the removals of these capsules will be implemented at a time that corresponds to the peak RV fluence at 80 years of operation, it will not be necessary to minimize the exposure to these capsules through a removal and reinsertion process. Instead, the applicant's exception and proposed times of removal for FNP 1 Capsule Z and FNP Unit 2 Capsule V will ensure that the neutron fluence exposures to the capsules are controlled (i.e., limited) so the withdrawals will provide meaningful data for 80 years of operation.

In Enclosure 2 of its letter dated July 27, 2004 (SNC Letter No. NL-04-1267), the applicant provided Commitment No. 18 on the Reactor Vessel Surveillance Program, to address its plans for implementing alternative dosimetry once the sixth surveillance capsules are removed from the Farley, Units 1 and 2 RVs (i.e., Capsule Z for Farley, Unit 1, and Capsule V for Farley, Unit 2):

> Reactor Vessel Surveillance Program:
>
> For each unit, FNP will install alternative dosimetry to monitor neutron fluence on the reactor vessel after removal of the last surveillance capsule in that unit. After all surveillance capsules have been removed, the exposure conditions of the reactor vessel will be monitored to ensure consistency with those used to project the effects of embrittlement to the end of the license period. Any plant operating restrictions (on parameters such as inlet temperature, neutron flux, etc.) will be determined. The program will include provisions that if reactor vessel exposure conditions are altered such that the analysis assumptions could be invalidated, appropriate actions will be performed (e.g., re-evaluation, re-instituting an active surveillance program, notifying the NRC, etc.) to assure the adequacy of the projections to the end of the license period.

The applicant committed to implement this commitment after removal of the last surveillance capsule in each of the FNP units. Since the applicant's commitment addresses the need for implementing alternative dosimetry after the final capsules have been removed, the applicant's program conforms to the recommended provisions in GALL AMP XI.M31 for alternative dosimetry implementation. Therefore, the staff concludes, that the applicant's exception to remove the sixth capsules when the fluence for the capsules corresponds to the 80-year fluence for the RVs, and commitment to implement alternative dosimetry prior to the following startups of the reactors, are acceptable. Based on this assessment, the staff concludes that the [Monitoring and Trending] program attribute for the RVSP is acceptable.

[Acceptance Criteria] The applicant stated that the capsule removal and analysis is performed in accordance with the requirements of Appendix H to 10 CFR Part 50. The staff's evaluation of the Monitoring and Trending program attribute includes a discussion of the staff's consideration of the criteria for the capsule withdrawal schedules. For capsule test specimen analyses, the rule requires licensees to apply the test procedures and reporting requirements of ASTM E185-82, to the extent practical, for the configuration of the test specimens in the capsule. The rule also requires that the surveillance capsule test results be reported to the NRC within 1 year of capsule removal. The staff finds that the applicant's acceptance criteria for capsule test specimen analyses are acceptable because they appropriately reference the test analysis and reporting requirements of Appendix H to 10 CFR Part 50.

The applicant also referenced the acceptance criteria (screening criteria) of 10 CFR 50.61 for calculating the RT_{PTS} values required for PTS assessments, as well as the acceptance criteria of Appendix G to 10 CFR Part 50 for USE determinations and P-T limit calculations. The staff finds these acceptance criteria to be acceptable because the applicant appropriately referenced the correct requirements in 10 CFR Part 50 for these assessments. These acceptance criteria are related to the individual TLAAs on neutron irradiation embrittlement of the RV beltline materials. The staff evaluates these TLAAs in Section 4.2 of this SER.

[Operating Experience] In Appendix B.3.4.13 to the LRA, the applicant stated that the FNP unit's surveillance specimens have been withdrawn and tested in the past, and data from these surveillance capsules and from other industry sources have been used to verify and predict the performance of the FNP RV beltline materials with respect to neutron embrittlement.

The following Westinghouse topical reports document the design for the Reactor Vessel Surveillance Program for FNP, Units 1 and 2:

- WCAP-8810—for FNP, Unit 1
- WCAP-8956—for FNP, Unit 2

The applicant has reported the test results for the following FNP Unit 1 surveillance capsules to the NRC, in accordance with the reporting requirements of Appendix H to 10 CFR Part 50:

- Capsule Y—data reported in WCAP-9717 and reassessed in WCAP-16221-NP
- Capsule U—data reported in WCAP-10474 and reassessed in WCAP-16221-NP
- Capsule X—data reported in WCAP-11563 and reassessed in WCAP-16221-NP
- Capsule W—data reported in WCAP-14196 and reassessed in WCAP-16221-NP
- Capsule V—data reported in WCAP-16221-NP

The applicant has reported the test results for the following FNP Unit 2 surveillance capsules to the NRC, in accordance with the reporting requirements of Appendix H to 10 CFR Part 50:

- Capsule U—data reported in WCAP-10425 and reassessed in WCAP-15171
- Capsule W—data reported in WCAP-11438 and reassessed in WCAP-15171
- Capsule X—data reported in WCAP-12471 and reassessed in WCAP-15171
- Capsule Z—data reported in WCAP-15171

In its Operating Experience program attribute, the applicant stated that it may use other industry surveillance data relevant to the neutron irradiation embrittlement assessments (i.e., PTS, USE, and P-T limits) that are required for FNP, Units 1 and 2. Because SNC indicated that it might apply surveillance data from sources other than the FNP Reactor Vessel Surveillance Program to the neutron irradiation embrittlement assessments for FNP, Units 1 and 2, the staff requested that SNC provide additional information on which supplemental surveillance data it would apply to the neutron irradiation embrittlement assessments for FNP, Units 1 and 2. The staff also requested that SNC justify why it considers the supplemental surveillance data to be valid for incorporation into these assessments. In the RAI, the staff requested that SNC clarify how it applied RV surveillance data from other plants to the assessments of its TLAAs, including those for adjusted reference temperature, USE, PTS ,and P-T limit calculations. The staff issued these requests in RAI B.3.4-1.

The applicant provided the following response to RAI B.3.4-1 in its letter dated May 10, 2004 (SNC Letter No. NL-04-0831):

> In response to Generic Letter 92-01, Revision 1, Supplement 1, SNC applied all relevant industry data to determine "best estimate" copper and nickel values for FNP weld material. FNP's result was that using the "best estimate" copper and nickel content for FNP weld material did not cause the weld material to become limiting so FNP's neutron irradiation embrittlement assessments were not affected. The NRC has already accepted FNP's response to Generic Letter 92-01 and no additional supplemental or external data is expected to be applied to the Farley Reactor Vessel Surveillance Program.

The applicant's response to RAI B.3.4-1 indicates that the industry data the applicant is referring to are the relevant industry "best-estimate" copper and nickel alloying values compiled by Combustion Engineering (CE) for CE-fabricated RV weld materials. The CE RVs that are within the scope of CE's generic alloying chemistry evaluations include the FNP RVs. The staff issued its RAIs on GL 92-01, Revision 1, Supplement 1, to ensure that licensees owning U.S. light-water reactors would apply all relevant copper and nickel alloy chemistry data for their RV beltline welds to the RV integrity assessments for their vessels. For license renewal purposes, these structural integrity assessments are the TLAAs on neutron irradiation embrittlement; for FNP, these include the TLAAs on USE assessments, assessments for PTS, adjusted reference temperature calculations (RT_{NDT} value calculations) for the 1/4T and 3/4T locations of the RVs, and the P-T limits for the RVs.

The staff has confirmed in its review of the TLAAs on neutron irradiation embrittlement that the applicant has applied all relevant copper and nickel alloy chemistry data to the assessments. Section 4.2 of the LRA includes these assessments and Section 4.2 of this SER presents the staff's evaluation of them. Because the applicant has clarified the type of external surveillance data it applied, and because the staff has validated that the applicant has applied all relevant copper and nickel alloy chemistry data to its TLAAs on neutron irradiation embrittlement, the staff concludes that the applicant's response to RAI B.3.4-1 is acceptable. RAI B.3.4-1 is resolved. The staff also concludes that the Operating Experience program attribute is acceptable because the applicant has considered all of the surveillance data that are applicable to the Reactor Vessel Surveillance Program and the TLAAs on neutron irradiation embrittlement.

In its conclusion for the Reactor Vessel Surveillance Program, the applicant stated that the program will be "maintained in compliance with the requirements of 10 CFR Part 50, Appendix H, with NRC-approved exceptions." This conclusion, as stated in the version of Section B.3.4 submitted with the application, created some ambiguity as to the types of exceptions from Appendix H to 10 CFR Part 50 the applicant referred. As required by 10 CFR 50.60(a), licensees of operating U.S. light-water reactors must implement the fracture toughness requirements of Appendix G to 10 CFR Part 50, and the reactor vessel surveillance program requirements of Appendix H to 10 CFR Part 50. Title 10, Section 50.60(b), of the *Code of Federal Regulations* permits licensees to use proposed alternatives to the requirements in these appendices, if an exemption is requested and granted by the Commission under the exemption provisions of 10 CFR 50.12. The staff indicated to the applicant that it did not have an issue with the conclusion for the Reactor Vessel Surveillance Program, if the exceptions to which the applicant referred are exemptions it requested under the provisions of 10 CFR 50.60(b) and granted by the staff under 10 CFR 50.12. However, if the exceptions pertain to any deviations from the pertinent requirements of Appendix H to 10 CFR Part 50, as identified as exceptions to program attributes of GALL AMP XI.M31, the staff informed the applicant that 10 CFR 50.60(b) requires that the exceptions be submitted as exemptions from the requirements of Appendix H to 10 CFR Part 50. The staff must approve any exemptions the applicant submits, in accordance with the five exemption acceptance criteria specified in the provisions of 10 CFR 50.12.

The staff therefore requested that the applicant modify the conclusion section for the Reactor Vessel Surveillance Program (LRA AMP B.3.4) to state that, "The RVSP will be implemented and maintained in accordance with the requirements of 10 CFR Part 50, Appendix H, unless alternatives to the requirements of the rule are requested under 10 CFR 50.60(b) and granted under 10 CFR 50.12." Otherwise, the staff requested that the clause "with NRC-approved exceptions" be deleted from the Conclusion section of the AMP. The staff identified this issue as RAI B.3.4-2.

The applicant responded to RAI B.3.4-2 in a letter dated May 10, 2004 (SNC Letter No. NL-04-0831). In the response, the applicant clarified that the exceptions in the Conclusion section for the Reactor Vessel Surveillance Program refer to any exemptions to Appendix H to 10 CFR Part 50 requested under the requirements of 10 CFR 50.60 and granted in compliance with one of the exemption acceptance criteria of 10 CFR 50.12. Based on this response, the staff concludes that the applicant's response to RAI B.3.4-2 is acceptable because the applicant has clarified that the exceptions it referred to in the conclusions are exemptions requested and granted under the NRC's exemption approval processes. The staff also considers that the applicant's conclusion for the Reactor Vessel Surveillance Program is acceptable because it validates that the applicant will continue to implement the program in accordance with the requirements of Appendix H to 10 CFR Part 50, with the exception that the additional requirements of the license condition stated in Section 3.0.3.2.2.3 of this SER will also apply to the program's scope and implementation. Section 3.0.3.2.2.3 of this SER discusses the basis for issuing the additional license condition on the Reactor Vessel Surveillance Program.

FSAR Supplement

Section A.2.4 of Appendix A to the FNP LRA provides the applicant's FSAR Supplement summary description for the Reactor Vessel Surveillance Program. In this section of the LRA, the applicant provided the following summary description for the Reactor Vessel Surveillance Program:

> The Reactor Vessel Surveillance Program will be used to predict changes in reactor vessel beltline material fracture toughness during the period of extended operation. The program will be used to evaluate neutron embrittlement through surveillance capsule testing and evaluation, fluence calculations and benchmarking, and monitoring of effective full power years (EFPYs). For fluence calculations, FNP uses Regulatory Guide 1.190 which provides for a "best estimate" fluence calculation.

This FSAR summary description provides an acceptable general description of the FNP Reactor Vessel Surveillance Program. However, Appendix H to 10 CFR Part 50 requires licensees to submit any proposed changes to their RV surveillance programs' withdrawal schedules to the NRC for review and approval. To ensure that this reporting requirement will carry forward after the FNP operating licenses have been renewed, the staff is imposing the following condition in the renewed licenses for FNP, Units 1 and 2:

> All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of 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 NRC prior to implementation. All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the NRC.

Conclusion

On the basis of its review and audit of the applicant's program, the staff finds that the program attributes for the Reactor Vessel Surveillance Program are acceptable 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 Fuel Oil Chemistry Control Program

Summary of Technical Information in the Application

Section 4.2 of Appendix B to the LRA, "Fuel Oil Chemistry Control Program," describes the applicant's Fuel Oil Chemistry Control Program. The applicant stated that the program is consistent with GALL AMP XI.M30, "Fuel Oil Chemistry," with an exception and an enhancement. The applicant credited this AMP with monitoring aging management of the loss of material from the emergency diesel fuel oil system components.

The applicant also stated that the FNP Fuel Oil Chemistry Control Program is governed by FNP's TS. These include surveillance and maintenance procedures to mitigate corrosion, as well as measures to verify the effectiveness of this AMP and confirm the absence of an aging effect.

Staff Evaluation

During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The FNP Audit and Review Report documents details of the staff's evaluation of the FNP audit and review. Furthermore, the staff reviewed the program's exception and enhancement and its justification to determine whether the AMP, with the exception and enhancement, remains adequate to manage the aging effects for which it is credited.

In accordance with its TS, the applicant uses ASTM D270-65 to perform fuel oil sampling and sample analysis. GALL AMP XI.M30 prescribes ASTM D4057. The applicant compared the standards cited in the plant TS against the standards cited in the GALL Report. The Fuel Oil Chemistry Control Program performs water, sediment, and viscosity analyses; however, the program does not credit particulate analysis of fuel oil for aging management. Particulate analysis is performed on diesel fuel to address diesel performance concerns (i.e., filter clogging) and does not have a significant impact on pressure boundary integrity. The applicant stated that because the parameters important to corrosion are monitored by the program, no significant difference exists in the ability of the program to manage aging effects. The applicant stated that operating experience confirms that the Fuel Oil Chemistry Control Program has been effective in managing aging.

The staff reviewed the exception concerning the ASTM standards, which the applicant uses in accordance with TS Section 5.5.13. The applicant tests for water and sediments, kinematic viscosity, insolubles, bacteria, and fungi. The applicant does not test for particulates, as required by the GALL Report. The staff determined that this exception is acceptable because sediments are a good indicator of particulates, and the applicant uses standards and criteria that are consistent with the TS requirements contained in the CLB.

The applicant stated that it will evaluate the scope of the program, as an enhancement, and the need to improve procedural guidance for maintaining and monitoring the diesel-driven fire pump fuel oil system. If changes are necessary, the applicant will implement the changes before the period of extended operation. The staff determined that this enhancement is acceptable because any such changes will provide additional assurance that the effects of aging will be adequately managed. The applicant addressed this enhancement in Appendix A, FSAR Supplement, under A.2.9, Fuel Oil Chemistry Control Program, of the LRA. In addition, by letter dated July 27, 2004, the applicant included this enhancement as a commitment in its FNP-License Renewal Future Action Commitments.

In its letter dated May 28, 2004 (SNC Letter No. NL-04-0924), the applicant provided its errata information to the LRA. In errata item no. 4, the applicant stated that for component types “Fuel Oil Storage Tanks” and “EDG Day Tanks” in Table 3.3.2-14, the One-Time Inspection Program (in addition to the Fuel Oil Chemistry Program) should be listed in the Aging Management Programs column for the fuel oil environment only. In Section B.5.5, One-Time Inspection Program, under the Detection of Aging Effects element, the applicant stated that it will perform one time inspections on selected components using proven nondestructive (NDE) methods including visual, volumetric, surface techniques, and hardness testing, as applicable to the selected components. The applicant credited the Fuel Oil Chemistry Control Program (AMP B.4.2) and the One-Time Inspection Program (AMP B.5.5) with managing the aging effect of loss of material for diesel fuel oil tanks in the diesel fuel oil system, which is consistent with the GALL Report, with one exception, which was discussed above. Section 3.3.2.2.7 of this SER contains staff’s further evaluation of loss of material in the diesel fuel oil system to verify the effectiveness of the Fuel Oil Chemistry Control Program.

On the basis of its audit and review of this AMP, the associated program master document, the relevant station administrative procedure, a sample of implementing procedures, and its letters dated May 28, 2004 and July 27, 2004, the staff determined that the Fuel Oil Chemistry Control Program is consistent with the GALL Report, and that the program’s exception and enhancement are acceptable.

Operating Experience

The staff reviewed the operating experience associated with the Fuel Oil Chemistry Control Program. Condition reports were found which documented abnormalities, such as leakage at a pipe nipple and failed moisture and sediment testing.

Based upon a condition report and work order search, the staff determined these instances were isolated, rather than systemic, and did not indicate programmatic failure. The staff also confirmed that the applicant cleaned and performed visual inspections of several EDG fuel oil storage tanks. The applicant has found the overall condition of the tanks to be satisfactory and has not noted any significant degradation.

Based on its review of the operating experience, the staff concludes that the Fuel Oil Chemistry Control Program adequately manages the aging effect that has been observed at the applicant’s plant.

FSAR Supplement

In Appendix A.2.9 to the LRA, the applicant provided the FSAR Supplement for the Fuel Oil

Chemistry Control Program. The staff reviewed this section and determined that the information in the FSAR Supplement provides an adequate summary of the program activities. The staff finds this section of the FSAR Supplement sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. In addition, the staff reviewed the applicant's exception and the enhancement to the GALL Report program and finds 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Structural Monitoring Program

Summary of Technical Information in the Application

Section B.4.3, "Structural Monitoring Program," of the LRA describes the applicant's Structural Monitoring Program. The applicant stated that the Structural Monitoring Program is consistent with GALL AMPs XI.S5, ?Masonry Wall Program," and XI.S6, "'Structures Monitoring Program," with enhancements. Further, the applicant stated that it uses the Structural Monitoring Program to monitor the condition of structures and structural components within the scope of the Maintenance Rule, and, as a result, indicated that there is no loss of structure or the structural component intended function. The Structural Monitoring Program also includes the masonry walls identified in NRC Inspection and Enforcement (IE) Bulletin 80-11, and NRC Information Notice (IN) 87-67.

Staff Evaluation

During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The FNP Audit and Review Report documents details of the staff's evaluation of the FNP audit and review. Furthermore, the staff reviewed the enhancement and its justification to determine whether the AMP, with the enhancement, remains adequate to manage the aging effects for which it is credited.

The FNP Structural Monitoring Program will be enhanced to monitor structures and structural components that are within the scope of license renewal, but are not currently monitored by the program. An enhancement will also be made to the Structural Monitoring Program to clarify the hangers and supports to be inspected in Category I buildings. The staff reviewed these enhancements and found them to be acceptable on the basis that these components require aging management, and therefore, need to be included in this program. The applicant has included its commitment to enhance the program in Appendix A.2.10 to the LRA.

On the basis of its review of this AMP, the associated program master document, the relevant station administrative procedure, and a sample of implementing procedures, the staff determined that the Structural Monitoring Program is consistent with the GALL Report, and that the program enhancement is acceptable.

Operating Experience

The staff reviewed the operating experience associated with the Structural Monitoring Program. The applicant stated that a formal operating experience program is in place at FNP, and that improvements have been made to the Structural Monitoring Program. Plant-specific operating experience is derived from condition report searches, personnel interviews, and Structural Monitoring Program inspection report reviews.

The applicant indicated that baseline inspections conducted during the period of June 1996 through August 1997 established a reference in time for comparison to future inspections. Periodic inspections commenced in April 2000. The inspections conducted during the first 5-year period included all accessible areas in the scope of the Structural Monitoring Program. The staff's assessment of the program's operating experience review concluded that administrative controls are in effect and are effective in identifying age-related degradation and initiating corrective action.

Based on its review of the above operating experience, the staff concludes that the Structural Monitoring Program adequately manages the aging effects that have been observed at FNP.

FSAR Supplement

In Appendix A.2.10 to the LRA, the applicant provided the FSAR Supplement for the Structural Monitoring Program. The staff reviewed this section and determined that the information in the FSAR Supplement provides an adequate summary of the program activities. The staff finds this section of the FSAR Supplement sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. In addition, the staff reviewed the enhancements to the GALL Report program and finds 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 Service Water Program

Summary of Technical Information in the Application

Section B.4.4. "Service Water Program," of the LRA describes the Service Water Program. The applicant stated that the Service Water Program is consistent with GALL AMP XI.M20, "Open Cycle Cooling Water System (OCCW)," with an enhancement.

The applicant stated that the Service Water Program activities implement the recommendations of GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment." Program activities include mitigation, as well as performance and condition monitoring techniques that manage fouling and loss of material in the service water (SW) system and associated components.

The applicant stated that the Service Water Program prevents or mitigates fouling and loss of material in the service water system and components, in part, by intermittent injection of the appropriate water treatment chemicals. Other preventive aspects of the Service Water Program include periodic flushing of low-flow and stagnant lines to mitigate or prevent fouling, and heat exchanger cleaning at regular intervals. Volumetric examination may be used to detect pipe wall thinning. The applicant visually inspects some components for fouling or loss of material.

Staff Evaluation

During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The FNP Audit and Review Report document details of the staff's evaluation of the FNP audit and review. Furthermore, the staff reviewed the enhancement and its justification to determine whether the AMP, with the enhancement, remains adequate to manage the aging effects for which it is credited.

The applicant stated, in Appendix B to the LRA, that the scope of the Service Water Program will be enhanced to include inspection of piping from the main service water header to the air compressor credited for Appendix R safe shutdown and the inspection of the service water pump columns. The staff reviewed this enhancement and found it to be acceptable on the basis that these components require aging management per 10 CFR 54.4, and therefore, this enhancement is needed. Appendix A.2.11 to the LRA addresses this commitment.

On the basis of its review of this AMP, the associated program master document, the relevant station administrative procedure, and a sample of implementing procedures, the staff determined that the Service Water Program is consistent with the GALL Report, and that the enhancement in the Service Water Program is acceptable.

Operating Experience

The applicant stated in the LRA that program inspections and plant observations have revealed some instances of local loss of material, much of it in stagnant sections of piping. There has also been evidence of loss of material in the containment cooler, CCW, and diesel generator heat exchangers. The applicant has taken corrective actions. Fouling was found to have occurred, including biofouling (e.g., live clams). Corrective actions included procedure revisions and an engineering evaluation to determine flushing needs. The applicant continues to find evidence of microbiologically influenced corrosion (MIC) without severe problems or loss of intended function.

The staff reviewed the applicant's operating experience report, which includes specific operating experience for the Service Water Program. The operating experience includes issues with biofouling and loss of material which the applicant documented and corrected. The staff noted that the applicant's implementation of GL 89-13 at FNP more than a decade ago has proven effective in managing fouling and loss of material in piping and components of the service water system.

Based on its review of the above operating experience, the staff concludes that the Service Water Program adequately manages the observed aging effects at FNP, Units 1 and 2.

FSAR Supplement

In Appendix A.2.11 to the LRA, the applicant provided the FSAR Supplement for the Service Water Program. The staff reviewed this section and determined that the information in the FSAR Supplement provides an adequate summary of the program activities. The staff finds this section of the FSAR Supplement sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. In addition, the staff reviewed the enhancement to the GALL Report program and finds 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 Fire Protection Program

Summary of Technical Information in the Application

Section B.4.5, "Fire Protection Program," of the LRA describes the applicant's Fire Protection Program. The applicant stated that the program is consistent with GALL AMPs XI.M26, "Fire Protection," and XI.M27, "Fire Water System", with enhancements. The applicant stated that the Fire Protection Program will provide inspections, performance testing and monitoring, and aging management activities during the period of extended operation for water-and gas-based fire protection systems, fire dampers, fire doors, fire penetration seals, cable wrap, and fire pump diesels (including the external surfaces of exposed fuel oil piping). The applicant indicated that this program will detect loss of material, fouling, cracking, and change in material properties (CO_2 tank insulation) in the applicable fire protection components.

Staff Evaluation

During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The FNP Audit and Review Report documents details of the staff's evaluation of the FNP audit and review. Furthermore, the staff reviewed the enhancements and its justification to determine whether the AMP, with enhancements, remains adequate to manage the aging effects for which it is credited.

The staff identified differences in the frequency of inspections used at FNP. Specifically, the applicant tests CO_2 and Halon systems every 18 months, instead of biannually as recommended by the GALL Report. The applicant's fire door inspection frequency is also every 18 months, instead of biannually, as recommended by the GALL Report. The applicant inspects yard hydrants annually, instead of biannually as recommended by the GALL Report.

The staff reviewed the applicant's basis document, plant operating experience, and fire surveillance procedures. Because these aging effects occur over a considerable period of time, the staff concludes that the 18-month inspection interval will be sufficient to detect aging of CO_2, Halon, and fire doors. The staff also concluded that the applicant's annual visual inspection of the yard hydrants will be sufficient.

The applicant made the following four enhancements to the GALL Report elements:

(1) The fire protection sprinkler system piping will be subjected to wall thickness evaluations (e.g., nonintrusive volumetric testing and/or visual inspections during plant maintenance) before the period of extended operation and at specific intervals thereafter. The plant-specific inspection interval will be established from the initial inspection results and revised as appropriate on the basis of subsequent inspection results.

(2) A sample of sprinkler heads will be inspected by using the guidance of Section 5.3.1.1.1 of National Fire Protection Association (NFPA) 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," at or before 50 years of service and every 10 years thereafter.

(3) Diesel-driven fire pump surveillance procedures will be upgraded to provide more detailed instructions related to inspection of the fuel oil supply piping.

(4) The current practice of replacing CO_2 hoses at 5-year intervals will be formalized in fire protection procedures.

The staff determined that the enhancement to include the sprinkler piping and sprinkler heads within the scope of this program is acceptable because they are exposed to the same environment as the other in-scope components.

Interim Staff Guidance (ISG)-04 revised the criteria for the GALL AMP XI.M27 Parameters Monitored or Inspected program element to no longer recommend the use of GL 89-13 in determining the system's ability to maintain pressure and internal system corrosion conditions. Rather, ISG-04 recommends either periodic flow testing of the fire water system using the guidelines of NFPA 25, at the maximum design flow, or periodic wall thickness evaluations to ensure that the system maintains its intended function. Based on the applicant's commitment to inspect fire water system components, the staff determined enhancement (1) to be acceptable and to satisfy ISG-04.

ISG-04 revised criteria for the GALL AMP XI.M27 Detection of Aging Effects program element to recommend sprinkler head inspections before the end of the 50-year sprinkler head service life and at 10-year intervals thereafter during the period of extended operation to ensure that signs of degradation are detected in a timely manner. Based on the revised GALL Report criteria in ISG-04, and the applicant's commitment to rely upon applicable codes and standards to develop test procedures, the staff determined enhancements (2)–(4) to be acceptable.

The applicant addressed aforementioned enhancements (1) through (4) in Appendix A, FSAR Supplement, under A.2.12, Fire Protection Program, of the LRA. In addition, by letter dated July 27, 2004, the applicant included these enhancements as a commitment in its FNP-License Renewal Future Action Commitments.

On the basis of its review of this AMP, the associated program master document, the relevant station administrative procedure, and a sample of implementing procedures, the staff determined that the Fire Protection Program is consistent with the GALL Report, that ISG-04 is satisfied, and that the enhancements in the program are acceptable.

Operating Experience

The applicant stated in the LRA that since the inception of the Fire Protection Program, ongoing internal and external assessments have been performed, including the NRC's triennial inspections. These assessments effectively identified programmatic strengths and weaknesses and prompted corrective actions. Inspections, performance testing, and performance monitoring by the existing Fire Protection Program have been effective in managing age-related degradation so that corrective actions are taken well before a loss of intended function could occur.

Specific operating experience indicates that there have been occasions in which loss of material occurred along the bottom of specific sections of normally dry fire protection piping. The applicant indicated that it had attributed this to drainage problems associated with operational or design/installation practice, and it has taken corrective actions to prevent recurrence.

With regard to the CO_2 system, the applicant conducted a review which covered approximately 15 years of operation. The results indicated very few age-related instances requiring maintenance. Most of the items involved replacement of bulbs, valve seals, rubber seats, and pilot valve seat discs.

Based on its review of the above operating experience, the staff concludes that the Fire Protection Program adequately manages the aging effects that have been observed at FNP.

FSAR Supplement

In Appendix A.2.12 to the LRA, the applicant provided the FSAR Supplement for the Fire Protection Program. The staff reviewed this section and determined that the information in the FSAR Supplement provides an adequate summary of the program activities. The staff finds this section of the FSAR Supplement sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. In addition, the staff reviewed the enhancements to the GALL Report program and finds 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Reactor Vessel Internals Program

Summary of Technical Information in the Application

The applicant described the Reactor Vessel Internals Program in LRA Section B.5.1. The applicant's discussion in LRA Section B.5.1 indicates that the Reactor Vessel Internals Program incorporates program attributes from both GALL AMPs XI.M16, "PWR Vessel Internals," and XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)."

In its letter dated April 29, 2004 (SNC Letter No. NL-04-0715), the applicant revised its scope and description of the Reactor Vessel Internals Program to indicate that the AMP is based on the following industry initiative and attributes:

- SNC will continue to participate in the industry's initiatives intended to clarify the nature and extent of aging mechanisms potentially affecting reactor vessel internals.

- SNC will incorporate the results of these initiatives (to the extent that they are applicable to the FNP reactor internals) into the scope, inspection requirements (including inspection locations, methods, qualifications, and frequencies), acceptance criteria, and corrective actions for the RV Internals Program.

- SNC will submit an inspection plan for the FNP RV Internals Program for NRC review and approval at least 24 months prior to entering the periods of extended operation for the FNP units.

- The FNP RV Internals Program is consistent with the 10 attributes of the aging management program described in NUREG 1801—Section XI.M13 and Section XI.M16, except as described above.

Staff Evaluation

[Scope of Program] The applicant stated that the Reactor Vessel Internals Program is a new, integrated inspection program credited with the management of (1) crack initiation and growth due to irradiation-assisted stress-corrosion cracking (IASCC), (2) loss of fracture toughness due to irradiation embrittlement, thermal embrittlement, or void swelling, and (3) changes in material properties as a result of void swelling. The applicant indicated that the program will supplement the RV internals (core support structures) inspections required by the ASME Code, Section XI, Subsection IWB Inservice Inspection Program, Category B-N-3.

In Section 3.1.3.1.2 of this SER, the staff evaluates the mechanisms that could induce loss of material in nickel-chromium-iron (NiCrFe) and stainless steel RV internal components given exposure to borated water. In RAI 3.1.3.1.2-1, parts a and b, the staff requested information about the different aging mechanisms that could induce loss of material in the NiCrFe and stainless steel RV internal components and justification as to why the applicant considered the Water Chemistry Control Program capable of managing loss of material in these components, particularly if the loss of material aging effect was determined to be induced by a mechanical-type of aging mechanism, such as wear, erosion, fretting, or galling.

In the applicant's response to RAI 3.1.3.1.2-1, part a, the applicant confirmed that the RV internals upper core plate alignment pins, holddown springs, clevis inserts and fasteners, radial support keys and fasteners, and flux detector thimble tubes were the RV internal components that could potentially be subject to loss of material as a result of a mechanical-type of aging mechanism. Further, wear was the aging mechanism that could induce loss of material in these components. In response to RAI 3.1.3.1.2-1, part b, the applicant indicated that it would use the Inservice Inspection Program to manage loss of material caused by wear in the RV internals upper core plate alignment pins, holddown springs, clevis inserts and fasteners, and radial support keys and fasteners. It would use the Flux Detector Thimble Tube Eddy Current Program to manage loss of material resulting from wear in the flux detector thimble tubes.

Because the applicant is not crediting the Reactor Vessel Internals Program for managing loss of material caused by wear in the RV internals upper core plate alignment pins, holddown springs, clevis inserts and fasteners, radial support keys and fasteners, and flux detector thimble tubes, the applicant has provided an acceptable basis for omitting loss of material due to wear as an aging effect/aging mechanism that is within the scope of the AMP. The applicant has identified that the following aging effects/aging mechanisms of concern are within the scope of the AMP:

- cracking induced by IASCC

- loss of fracture toughness induced by neutron irradiation embrittlement, void swelling, and thermal aging for cast austenitic stainless steel (CASS) RV internals

- changes in component physical dimensions as a result of void swelling

The staff finds this acceptable because these aging effects/aging mechanisms are identified in GALL AMPs XI.M13 and XI.M16 as being applicable to RV internal components.

The applicant stated that scope of the Reactor Vessel Internals Program includes the following RV internal components:

- baffle and former assemblies
- bottom-mounted instrumentation cruciforms (CASS)
- core barrel
- lower core plate and fuel alignment pins
- lower support forging
- lower support column bases

The staff determined that the list of components within the scope of the Reactor Vessel Internals Program was not consistent with the list of components identified in LRA Table 3.1.2-2 for which the AMP was credited. The staff requested that the applicant modify the scope of the Reactor Vessel Internals Program to make the list of components within the scope of the AMP consistent with the list of components for which the AMP is credited, as identified in Table 3.1.2-2 of the LRA. The staff identified this issue in RAI B.5.1-2.

The applicant provided its response to RAI B.5.1-2 in its letter dated April 29, 2004 (SNC Letter No. NL-04-0715). In this response, the applicant clarified that the list of components within the scope of the Reactor Vessel Internals Program is consistent with the list of RV internals in LRA Table 3.1.2-2 for which the AMP is credited. The staff finds this acceptable because (1) the applicant has clarified that the list of components within the scope of the Reactor Vessel Internals Program is consistent with the list of components in LRA Table 3.1.2-2 for which the AMP is credited, and (2) the applicant's list of components within the scope of the program is consistent with, and is at least as conservative, as the number of RV internals components listed in GALL Section IV.B2, and managed by either GALL AMP XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel" and/or GALL AMP XI.M16, "PWR Vessel Internals."

Consistency with NUREG-1801

GALL AMP XI.M16 provides the staff's recommendations for developing and implementing the program attributes for PWR RV internals programs. In the LRA, the applicant stated that the program is consistent with GALL AMPs XI.M16 and XI.M13, with certain exceptions. The Reactor Vessel Internals Program is a new, integrated inspection program credited in the LRA as an AMP for the aging effect of crack initiation and growth caused by IASCC, loss of fracture toughness due to irradiation embrittlement, thermal embrittlement or void swelling, or changes in material properties as a result of void swelling. The program will supplement the RV internals (core support structures) inspections required by the Inservice Inspection Program. During the audit and review conducted from November 3 to November 7, 2003, the staff evaluated the applicant's claim of consistency. The FNP Audit and Review Report documents the findings of the FNP audit and review. Furthermore, the staff reviewed the exceptions, and the applicant's justification for those exceptions, to determine whether the AMP remains adequate to manage the aging effects for which it is credited. The following paragraphs describe the staff's evaluation of the exceptions taken by the applicant in the program attributes for the Reactor Vessel Internal Program.

Exceptions to NUREG-1801

In Appendix B.5.1 to the LRA, the applicant took an exception to the staff's recommendation of augmented ultrasonic examinations of baffle bolt shafts. The applicant proposed instead to perform VT-1 visual examinations in lieu of the augmented ultrasonic examinations recommended in GALL AMP XI.M16 for baffle bolts. The applicant also stated that it will use its participation in the EPRI Materials Reliability Project (MRP) studies and activities on PWR RV internal components as the basis for determining which aging effects and mechanisms are applicable to the RV internal components and which methods of examination and frequency of examinations are needed for these components. Similarly, the applicant also took exception to the Detection of Aging Effects program attribute and proposed to limit its VT-1 and enhanced VT-1 examinations[1] only to those locations suggested by industry research and operating

1 The applicant provided the following definition of enhanced VT-1 examinations in the supplemental response to RAI B.5.1-3 dated June 25, 2004 (refer to SNC Letter No. NL-04-1096):

For the FNP Reactor Vessel Internals Program, SNC intends to use the definition for Enhanced VT-1 (EVT-1) examination adopted by the EPRI Materials Reliability Program (MRP) Reactor Internals Issue Task Group (RI-ITG). Currently, the EPRI Materials Reliability Program RI-ITG definition is provided in MRP-99, "Strategies for Managing Aging Effects in PWR Vessel Internals—Interim Update." MRP-99 adopts the examination requirements of BWRVIP-03, which describes EVT-1 as a visual examination method where the equipment and environmental conditions are such that a ½ mil detection resolution can be demonstrated against a neutral gray background. BWRVIP-03 demonstration protocols have been approved by the NRC staff in a safety evaluation regarding BWRVIP-03 and approved for license renewal in NUREG-1801, Section XI.M9, "BWR Vessel Internals."

Additionally, as stated in our response to RAI B.5.1-3 in SNC Letter No. NL-04-0715 (dated April 29, 2004), the scope, inspection requirements (inspection locations, methods, qualifications, and frequencies), acceptance criteria, and corrective actions for the Reactor Vessel Internals Program will be based on the results of industry initiatives intended to clarify the nature and extent of aging mechanisms potentially affecting the reactor vessel internals. Therefore, the examination methods proposed, including the definition for EVT-1 examination, could change as a result of the industry initiatives.

experience.

The staff believes that detection of cracking in baffle/former bolts is not possible by visual techniques because cracking typically occurs at the bolt head/shank intersections, which are not accessible for visual examination.[2] In the staff's SE on WCAP-14577, Revision 1-A, "License Renewal Evaluation: Aging Management for Reactor Internals," dated March 2001, the staff stated that ultrasonic examinations of the baffle/former bolt shafts should be used to augment the visual examination techniques that are required for these components under Section XI of the ASME Code, Inspection Category B-N-3. The applicant will need to address how it will manage cracking in the baffle bolts during the extended period of operation for FNP, Units 1 and 2. The staff included resolution of this issue within the scope of RAI B.5.1-3. The staff's discussion of the issues raised in RAI B.5.1-3 and the applicant's resolution of these issues is provided later in this section.

The RV internals made from CASS include the BMI cruciforms and the upper support column bases. In its SE on WCAP-14577, Revision 1, the staff stated that both thermal aging and neutron irradiation embrittlement could lower the fracture toughness of CASS RV internals (i.e., as manifested in a reduction in the critical crack size for the CASS materials) and identified the need for Westinghouse Owners Group (WOG)-member applicants to address the synergistic impacts of thermal aging and neutron irradiation embrittlement on the fracture toughness properties of their CASS RV internals. The applicant did not address this issue in LRA Section B.5.1. The staff included resolution of this issue within the scope of RAI B.5.1-3.

The staff also determined that the applicant is using $1x10^{21}$ n/cm^{2} (E \$ 0.1 MeV) as its threshold values for initiation of neutron irradiation embrittlement in CASS RV internals and has identified this as an exception from the program attributes for GALL AMP XI.M13. In comparison, GALL AMP XI.M13 lists the threshold for the initiation of neutron irradiation embrittlement in CASS RV internals as $1x10^{17}$ n/cm^{2} (E \$ 1.0 MeV).

In WCAP-14577, Revision 1, the WOG stated that the neutron fluences for CASS lower support castings will be less than $7x10^{20}$ n/cm^{2} (E \$ 0.1 MeV) through the expiration of the license renewal period for Westinghouse-designed PWRs. Thus, given this low level of fluence, neutron irradiation embrittlement should not be a concern for CASS RV internals found acceptable by the WOG's screening criterion of $1x10^{21}$ n/cm^{2} (E \$ 0.1 MeV) for neutron irradiation embrittlement. However, in its SE on WCAP-14577, Revision 1, the staff did not agree with the WOG's threshold for onset of neutron irradiation embrittlement in RV internal components. The staff informed the WOG that for RV internal components fabricated from CASS and hence subject to thermal aging and neutron irradiation embrittlement, exposure to high operating temperatures and high neutron fluences could have synergistic effects whereby service-degraded fracture toughness is reduced from the levels predicted independently for either of the mechanisms. The staff therefore informed the WOG that renewal applicants for Westinghouse-designed PWRs should describe their programs for managing aging in CASS RV internals during the license renewal period (the staff identified this as Renewal Applicant Action Item No. 6 in the SE of WCAP-14577, Revision 1).

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[2] Refer to the staff's final safety evaluation report (FSER, dated February 10, 2000) on Westinghouse Owners Group Topical Report WCAP-14577, Revision 1, "License Renewal Evaluation: Aging Management for Reactor Internals," dated October 2000.

The staff informed the applicant that it will need to address how it will manage cracking and loss of fracture toughness caused by thermal aging or neutron irradiation embrittlement in the CASS RV internals during the extended period of operation for FNP, Units 1 and 2, and justify the difference in the neutron irradiation embrittlement threshold value assumed for the CASS RV internals from that identified in GALL AMP XI.M13. The staff included resolution of these issues within the scope of RAI B.5.1-3.

In Section IV.B2 of the GALL Report, the staff acknowledged that participation in the industry's aging studies on PWR RV internal components (and specifically the industry initiative studies of the EPRI MRP on PWR RV internals) may be used as an alternative basis for determining exactly which types of inspections are necessary for these components.

Because it has been adopted in the GALL Report, use of industry research studies and activities on age-related degradation of PWR RV internal components may be cited as an alternative basis for determining which age-related degradation mechanisms are applicable to PWR RV internals and what types of examinations are necessary to manage these mechanisms. This is a process-oriented approach to aging management that will ensure that the inspections proposed for PWR RV internals are those that the industry research studies have demonstrated are necessary to maintain the structural integrity or functionality of the components. The NRC review of the recommended activities is an integral part of the industry initiative process.

However, any proposal to use the industry's research studies and activities on RV internals as the basis for aging management must be coupled with (1) a commitment to implement the recommendations that result from these studies and activities, and (2) a commitment to submit the inspection plan for the RV internals to the NRC for review and approval before the period of extended operation. The staff issued RAI B.5.1-3 to address this issue.

In its letter dated April 29, 2004 (SNC Letter No. NL-04-0715), the applicant provided its response to RAI B.5.1-3. The response included the following amended version of the program description for the Reactor Vessel Internals Program, as given in LRA Section B.5.1, and the following amended version of the FSAR Supplement summary description for the Reactor Vessel Internals Program, as given in LRA Section A.2.13:

> LRA Appendix B.5.1, Reactor Vessel Internals Program, Sections B.5.1.1 and B.5.1.3 should read as follows:
>
>> LRA Appendix B.5.1—Reactor Vessel Internals Program
>>
>> B.5.1.1 Program Description
>>
>> The new FNP Reactor Vessel Internals Program will be an integrated inspection program that addresses the reactor internals (as identified in LRA Table 3.1.2-2). It is intended to supplement the inspection requirements of ASME Section XI, IWB Category B-N-3 to ensure that aging effects do not result in a loss of intended function of internal components during the period of extended operation.
>>
>> The Reactor Vessel Internals Inspection Program manages the effects of crack initiation and growth due to irradiation assisted stress corrosion cracking; loss of fracture toughness due to irradiation embrittlement, thermal embrittlement, or void swelling; or changes in material properties (dimension) due to void swelling.
>>
>> SNC supports development of improved industry data, models, and inspection methodologies through active participation in the EPRI Materials Reliability Program Reactor Vessel Internals Issue Task Group

> and the Westinghouse Owners Group. SNC will continue to participate in industry initiatives intended to clarify the nature and extent of aging mechanisms potentially affecting reactor vessel internals. SNC will incorporate the results of these initiatives (to the extent that they are applicable to the FNP reactor internals) into the scope, inspection requirements (inspection locations, methods, qualifications, and frequencies), acceptance criteria, and corrective actions of the Reactor Vessel Internals Program.
>
> B.5.1.3 Exceptions to NUREG-1801
>
> The scope, inspection requirements (inspection locations, methods, qualifications, and frequencies), acceptance criteria, and corrective actions will be based on the results of industry initiatives intended to clarify the nature and extent of aging mechanisms potentially affecting the reactor vessel internals. SNC will submit an inspection plan for the FNP Reactor Vessel Internals Program for NRC review and approval at least 24 months prior to entering the periods of extended operation for the FNP units.

In its response to RAI B.5.1-3, the applicant clarified that the Reactor Vessel Internals Program will incorporate a number of key elements to establish the capability of the AMP's program attributes to manage aging in the FNP RV internal components. In particular, the applicant's response clarifies the following four issues:

(1) The response clarifies that the applicant will use industry-wide research studies and initiatives on age-related degradation of RV internal components to determine the inspection methods, inspection method qualifications, inspection frequencies, inspection method acceptance criteria, and corrective actions for the Reactor Vessel Internals Program.

(2) The response clarifies that the applicant will implement recommended inspection activities, acceptance criteria, and corrective actions that result from the industry's studies and initiatives on age-related degradation of RV internals components, as the recommendations apply to the design of the RV internals at the FNP units.

(3) The response clarifies that the applicant will submit an inspection plan for the FNP RV internals for staff review and approval at least 2 years before entering the period of extended operation for the FNP units. To obtain the NRC staff's approval of its proposed inspection plan prior to the period of extended operation, the applicant must submit a license amendment request. After the NRC staff's approval of the inspection plan for the FNP RV internals, any future changes to the inspection plan will be evaluated in accordance with the 10 CFR 50.59 process. The 2-year period will allow the applicant and the staff sufficient time to resolve any issues with the inspection plan.

(4) The response clarifies that the applicant will submit a commitment to the staff concerning the Reactor Vessel Internals Program that reflects the three elements discussed above.

The applicant's response to RAI B.5.1-3 also included an amended version of the FSAR Supplement summary description (i.e., Section A.2.13 of the LRA) for this AMP, which includes a statement that the applicant will make a commitment in the LRA that incorporates the three elements discussed above. This commitment will provide the basis for determining the scope and number of RV internals that are in need of examination, the type of examination methods (i.e., ultrasonic, VT-1, or enhanced VT-1 examination methods) and frequency of examinations required for managing cracking and other potential aging effects in the RV internals at FNP, the methods that are needed to qualify the ability of the examination methods to detect degradation, and the acceptance criteria that will be used to assess the examination results. The staff discusses this commitment further in the FSAR Supplement for this AMP.

The EPRI MRP initiatives on the aging of PWR RV internals includes studies on managing the cracking in baffle/former bolt materials and cracking and loss of fracture toughness properties for RV internals made from CASS. The staff concludes that the applicant's LRA commitment is acceptable because (1) it will apply acceptable industry guidelines that will ensure the use of only those inspections that are capable of detecting degradation before a loss of component intended function, (2) it will allow the staff to review the applicant's inspection plans for the RV internals based on the industry recommendations, and (3) it will provide the staff an opportunity to work with the applicant to resolve any potential issues with the inspection plan.

In the original program description for the Reactor Vessel Internals Program, the applicant also indicated that it was taking an exception on the number of examination cycles set forth in Section XI of the ASME Code, Subsection IWB, for RV internal components. The staff informed the applicant that it must submit this exception for review and approval, in accordance with 10 CFR 50.55a. The staff requested that the applicant withdraw this exception from the application and commit to following the ASME Code, unless specific relief is granted under the relief request or alternative program provisions of 10 CFR 50.55a. The staff identified this as RAI B.5.1-4.

The applicant provided its response to RAI B.5.1-4 dated April 29, 2004 (SNC Letter No. NL-04-0715). In this response, the applicant clarified that it was not taking exception to the number of examination cycles set forth in Section XI of the ASME Code, Subsection IWB, for inspection of RV internal components required under the FNP Inservice Inspection Program. The staff concludes that this is acceptable because it indicates that the applicant will continue to comply with 10 CFR 50.55a, unless specific relief is requested and granted on a given RV internal ISI requirement. The applicant also clarified that, for the augmented examinations that would be implemented as part of the Reactor Vessel Internals Program, the examination frequencies would be based on those recommended by the industry's initiatives on RV internal components. This is acceptable because it reflects the revision to the program previously discussed and accepted by the staff.

<u>FSAR Supplement</u>

In Section A.2.13 of Appendix A to the LRA, the applicant provided the FSAR Supplement for the Reactor Vessels Internals Program. The staff reviewed this section of the LRA and informed the applicant that it must update the summary description in Section A.2.13 of the LRA to reflect information that will be provided in the applicant's response to RAI B.5.1-3. This request was included within the scope of RAI B.5.1-3.

In its letter dated April 29, 2004 (SNC Letter No. NL-04-0715), the applicant provided its response to RAI B.5.1-3. The response included the following amended version of the FSAR Supplement summary description for the Reactor Vessel Internals Program, as given in LRA Section A.2.13:

> To address the staff's issues, SNC will revise the LRA FNP UFSAR Supplement A.2.13 to read as follows:
>
> A.2.13 REACTOR VESSEL INTERNALS PROGRAM

> The new FNP Reactor Vessel Internals Program will be implemented prior to entering the period of extended operation to provide an integrated inspection program that addresses the reactor internals. It will be governed by administrative controls and procedures to supplement the inspection requirements of ASME Section XI, IWB Category B-N-3 to ensure that aging effects do not result in a loss of intended function of internal components during the period of extended operation.
>
> The program will be used during the period of extended operation to manage the effects of crack initiation and growth due to irradiation assisted stress corrosion cracking; loss of fracture toughness due to irradiation embrittlement, thermal embrittlement, or void swelling; or changes in material properties (dimension) due to void swelling.
>
> SNC will continue to participate in industry initiatives intended to clarify the nature and extent of aging mechanisms potentially affecting reactor vessel internals. SNC will incorporate the results of these initiatives (to the extent that they are applicable to the FNP reactor internals) into the scope, inspection requirements (inspection locations, methods, qualifications, and frequencies), acceptance criteria, and corrective actions of the Reactor Vessel Internals Program.
>
> SNC will submit an inspection plan for the FNP Reactor Vessel Internals Program for NRC review and approval at least 24 months prior to entering the periods of extended operation for the FNP units.
>
> The FNP Reactor Vessel Internals Program is consistent with the 10 attributes of the aging management program described in NUREG-1801, Sections XI.M13 and XI.M16, except as described above.
>
> The “Farley Nuclear Plant—License Renewal Future Action Commitment” list will be revised accordingly.

The applicant’s response to RAI B.5.1-3, as it pertains to the FSAR Supplement summary description for the Reactor Vessel Internals Program, clarifies that the program will incorporate a number of key elements to establish the capability of the AMP’s program attributes to manage aging in the FNP RV internal components. Specifically, the applicant clarified the following four issues:

(1) The response clarifies that the applicant will use industrywide research studies and initiatives on age-related degradation of RV internal components to determine the inspection methods, inspection method qualifications, inspection frequencies, inspection method acceptance criteria, and corrective actions for the Reactor Vessel Internals Program.

(2) The response clarifies that the applicant will implement recommended inspection activities, acceptance criteria, and corrective actions that result from the industry’s studies and initiatives on age-related degradation of RV internals components, as the recommendations apply to the design of the RV internals at the FNP units.

(3) The response clarifies that the applicant will submit an inspection plan for the FNP RV internals for staff review and approval at least 2 years before entering the period of extended operation for the FNP units. The 2-year period will allow the applicant and the staff sufficient time to resolve any issues with the inspection plan.

(4) The response clarifies that the applicant will submit a commitment to the staff concerning the Reactor Vessel Internals Program that reflects the three elements discussed above.

In the staff's evaluation section associated with this AMP, the staff provided its basis for accepting the applicant's process for monitoring and trending age-related degradation in the FNP RV internals. The staff concludes that the FSAR Supplement summary description for the Reactor Vessel Internals Program, as amended in the applicant's letter dated April 29, 2004 (SNC Letter No. NL-04-0715), is acceptable because it reflects the revision to the program and process for the RV internals, which the staff found acceptable, as documented in Section 3.0.3.2.7 of this SER. In addition, the applicant's response reflects that it will make a commitment regarding the AMP which incorporates the key elements for the program and process that the staff found to be acceptable.

Conclusion

On the basis of its review and audit of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Non-EQ Electrical Cables Used in Instrumentation Circuits

Summary of Technical Information in the Application

Section B.5.6.1, "Non-EQ Electrical Cables Used in Instrumentation Circuits," of the LRA describes the non-EQ electrical cables used in instrumentation circuits. The applicant stated that the program for non-EQ electrical cables used in instrumentation circuits are consistent with GALL AMP XI.E2, "Electrical Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used In Instrumentation Circuits," with an exception.

The applicant stated that the Non-EQ Cables Program is a new inspection and testing program that will be implemented before the period of extended operation. It will be used to maintain the function of electrical cables which are not subject to the environmental qualification (EQ) requirements of 10 CFR 50.49, but are exposed to adverse localized environments caused by heat, radiation, or moisture. The applicant considered ISG-15 in preparation of the attributes of this new program.

Staff Evaluation

During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The FNP Audit and Review Report documents the FNP audit findings and conclusions. Furthermore, the staff reviewed the exception and its justification to determine whether the AMP, with the exception, remains adequate to manage the aging effects for which it is credited.

The aspect of the applicant's Non-EQ Cables Program described in Section B.5.6.1 of the LRA is consistent with GALL AMP XI.E2, with the exception that the applicant will incorporate program details applicable to the specific types of cables within the scope of the program, in accordance with the alternate XI.E2 program developed by the License Renewal Electrical

Working Group.

The staff observed a typographical error in Section 5.6.1.1 of the LRA. Specifically, the applicant referenced ISG-5 instead of ISG-15. In its letter dated December 5, 2003, the applicant stated that the correct reference is ISG-15.

In Sections 5.6.1.5 and 5.6.1.6 of Appendix B to the LRA, the Parameters Inspected or Monitored and the Detection of Aging Effects program attributes stipulated, in part that, “A representative sample of instrument circuit cables with sensitive, high-voltage, low-level signals which are installed in adverse localized environments will be tested....” GALL AMP XI.E2 and ISG-15 do not stipulate the use of sampling. The staff noted that the number of cables in this category is comparatively small (e.g., ex-core nuclear instrumentation cable). To address this difference, the applicant stated that it will revise the Parameters Monitored or Inspected and Detection of Aging Effects program attributes to test all cables in the alternate XI.E2 program, rather than a sample.

The applicant issued a supplement to the LRA dated December 5, 2003 (SNC Letter No. NL-03-2418), Enclosure 1, to address this issue. The applicant stated that sampling will be removed from the alternate XI.E2 program and that it will test all cables. During the audit and review conducted at the applicant’s headquarters office from December 15 to December 19, 2003, the staff determined that the applicant had revised the AMP master document.

In Section 5.6.1.8 of Appendix B to the LRA, the Acceptance Criteria program element and the AMP program documentation differ from GALL AMP XI.E2 and proposed ISG-15, which stipulate that calibration results or findings of surveillances are to be within the acceptance criteria, as set out in the surveillance procedures. The LRA and AMP acceptance criteria did not specify the use of calibration and surveillance testing, and excluded it in the AMP Operating Experience section, which stated in part, that “Testing of cables that have been exposed to heat and radiation can provide a possible indication of potential electrical cable degradation. This differs from NUREG 1801, Section XI.E2 use of operating experience in that changes in instrument calibration are not used.” The applicant stated that nuclear instrumentation circuits would be tested because the instruments are calibrated with the cables disconnected. Cable testing is a more desirable approach for this application because the calibration results would provide minimal information about the cables. The applicant issued a supplement to the LRA dated December 5, 2003 (SNC Letter No. NL-03-2418), Enclosure 1, to address this issue. In the response to Question E30, the applicant restated why it used the alternate XI.E2 program. The staff concludes that because the cables are disconnected during the calibration test, and because the applicant agreed to test all cables, the exception to use the alternate XI.E2 program is acceptable.

During the audit and review, the staff requested the applicant to clarify how it considered non-EQ containment electrical penetrations. Table 4.4 of the LRA, “List of EQ Packages,” describes specific EQ packages. However, it was not evident that containment electrical penetrations were included in the table, and no AMP was credited for containment electrical penetrations.

By letter dated December 5, 2003 (SNC Letter No. NL-03-2418), the applicant stated that FNP has both EQ and non-EQ containment electrical penetrations. The pressure boundary function of both EQ and non-EQ electrical penetrations is covered under the Inservice Inspection Program. The Non-EQ Cables Program covers the electrical portions of the penetrations that provide a connection function for nonsafety-related equipment.

On the basis of its review of this AMP, the associated program master document, the relevant station administrative procedure, and a sample of implementing procedures, the staff determined that this AMP is consistent with the GALL Report, and that the exception to the non-EQ electrical cables used in instrumentation circuits is acceptable.

Operating Experience

The applicant stated in the Operating Experience section of FNP AMP B.5.6.1 that this program is a new program with no operating experience history. However, the applicant will use effective and proven testing techniques for this new program. Furthermore, the applicant will consider lessons learned during the performance of this program, additional industry experience, and other testing techniques developed in the industry.

The applicant stated, in the FNP LRA, that industry operating experience has shown that exposure to heat and radiation results in the degradation of insulating materials. Testing of cables that have been exposed to heat and radiation can provide a possible indication of potential electrical cable degradation. In addition to industry operating experience, the applicant investigated the operating history for in-scope electrical components using condition report searches, internal correspondence, plant walkdowns, and interviews.

The Operating Experience program element criteria in GALL AMP XI.E2 state that operating experience has shown that a significant number of cable failures are identified through routine calibration testing. Changes in instrument calibration can be caused by degradation of the circuit cable and are one indication of potential electrical cable degradation.

Furthermore, in ISG-15, the operating experience discussion states that the vast majority of site-specific and industrywide operating experience regarding neutron flux instrumentation circuits is related to cable/connector issues inside of the containment near the reactor vessel. There is comparatively far less operating experience in other, more benign areas of the plant.

During the audit, the staff noted that connectors were included in the Operating Experience attribute of ISG-15, but not in FNP AMP B.5.6.1. To clarify this, the applicant stated that connectors were included in GALL AMP XI.E2, and that it will revise the FNP AMP B.5.6.1 to include the draft ISG-15 wording for this attribute. By letter dated December 5, 2003 (SNC Letter No. NL-03-2418), the applicant submitted a supplement to the FNP LRA. In its response, the applicant agreed to revise its AMP master document to incorporate this wording. The staff reviewed and confirmed that the applicant’s AMP master document had been revised and found it to be acceptable.

On the basis of its review of the above operating experience and discussions with the applicant's technical staff, the staff concludes that the non-EQ electrical cables used in instrumentation circuits adequately manages the aging effects that have been observed at FNP.

FSAR Supplement

In Appendix A.2.19 to the LRA, the applicant provided the FSAR Supplement for the Non-EQ Cables Program. The staff reviewed this section and determined that the information in the

FSAR Supplement provides an adequate summary of the program activities. The staff finds this section of the FSAR Supplement sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. In addition, the staff reviewed the exceptions to the GALL Report program and finds 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Flow-Accelerated Corrosion Program

Summary of Technical Information in the Application

Section B.4.1, "Flow Accelerated Corrosion Program," of the LRA describes the applicant's Flow-Accelerated Corrosion Program. The applicant stated that the program is consistent with GALL AMP XI.M17, "Flow Accelerated Corrosion," with an enhancement. This AMP is credited for managing loss of material due to flow-accelerated corrosion (FAC) for specific component/commodity groups in the auxiliary steam and condensate, feedwater, main steam, and SG blowdown systems.

By letter dated July 27, 2004, the applicant provided an LRA supplement to the FAC Program. The applicant states that under the FAC Program, it has elected to replace some carbon steel piping and piping components with FAC-resistant chrome-molybdenum alloy steels. This is an on-going activity which recently resulted in alloy steel replacements in portions of FAC-susceptible systems that are in-scope for license renewal. Although the alloy steel has increased the resistance to flow-accelerated corrosion, the alloy steel components remain in the scope of the FAC program.

The applicant stated that its aging management review for alloy steels in FAC-susceptible systems concludes that the aging effects requiring management are conservatively bounded by those applicable to carbon steel components. The aging management programs applied to the carbon steel components are also applicable to the alloy steel components.

In lieu of adding new component/material combinations, the carbon steel material type in the aging management review summary tables for FAC-susceptible systems is defined to include FAC-resistance alloy steels.

Staff Evaluation

During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The FNP Audit and Review Report document the FNP audit findings and conclusions. Furthermore, the staff reviewed the enhancement and its justification to determine whether the AMP, with the enhancement, remains adequate to manage the aging effects for which it is credited.

The applicant has determined that the replacement SG steam nozzles are not FAC susceptible. The SG nozzle material is not carbon steel, but alloy steel. The staff requested the applicant to provide the material information for the feedwater inlet and main steam outlet nozzles. By letter dated August 19, 2004, the applicant provided its supplemental information to the LRA. In its response, the applicant stated that the alloy material specification applicable to the replacement SG feedwater inlet and main steam outlet nozzles is ASME SA-508 Class 3 alloy steel material which provides increased resistance to FAC as compared to carbon steel. Upon this basis, Item D1.1.2 of GALL IV D1-3, listed only carbon steel material as requiring management under this combination of environment and aging mechanism. The staff concludes that the applicant's determination, that the SG feedwater and main steam nozzles are not FAC susceptible, is consistent with GALL and finds it acceptable.

The applicant stated, in Appendix B to the LRA, that there are differences between the scope of the Flow-Accelerated Corrosion Program and the scope of GALL AMP XI.M17. To address the scope differences, the applicant stated that the scope of the FAC program will be enhanced to include the AFW pump turbine exhaust piping before the period of extended operation. The staff determined that this enhancement is acceptable because any such changes will provide additional assurance that the effects of aging will be adequately managed. The applicant addressed this enhancement in Appendix A, FSAR Supplement, under A.2.8, Flow Accelerated Corrosion Program, of the LRA. In addition, by letter dated July 27, 2004, the applicant included this enhancement as a commitment in its FNP-License Renewal Future Action Commitments.

On the basis of its review of this AMP, the associated program master document, the relevant station administrative procedure, and a sample of implementing procedures, the staff determined that the Flow-Accelerated Corrosion Program is consistent with the GALL Report, and that the program enhancement is acceptable.

Operating Experience

The applicant stated in the LRA that operating experience shows that a properly implemented flow-accelerated corrosion program is effective in managing FAC in high-energy carbon steel piping and components. The applicant stated that the NRC inspection reports have consistently reported that the applicant’s program is effective in maintaining high-energy carbon steel piping within acceptable wall thickness limits.

In addition, the applicant stated that it captured recent operating history when its engineering support department compared the plant-specific FAC operating experience for the feedwater system against NRC IN 2001-09, “Main Feedwater System Degradation in Safety-Related ASME Code Class 2 Piping Inside the Containment of a Pressurized Water Reactor.” Through 1R17 (Fall 2001), 74 points in the Unit 1 feedwater system had been examined. Through 2R15 (Fall 2002), 82 points in the Unit 2 feedwater system had been examined. Based upon recent examinations, the applicant had scheduled approximately eight components for replacement on Unit 1 during 1R18, and recommended approximately 25 feet of piping in the turbine building and one component in the main steam valve room for replacement during 2R16 for Unit 2.

Based on its review of the above operating experience, the staff concludes that the Flow-Accelerated Corrosion Program adequately manages the aging effects that have been observed at FNP.

FSAR Supplement

In Appendix A.2.8 to the LRA, the applicant provided the FSAR Supplement for the Flow-Accelerated Corrosion Program. The staff reviewed this section and determined that the information in the FSAR Supplement provides an adequate summary of the program activities. The staff finds this section of the FSAR Supplement sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report are indeed consistent with GALL. In addition, the staff reviewed the enhancement to the GALL Report program and finds 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Buried Piping and Tank Inspection Program

Summary of Technical Information in the Application

The applicant's buried piping and tank inspection program is described in AMP B.5.4, "Buried Piping and Tank Inspection Program" of the LRA. The applicant stated that the program is a new program that will be initiated prior to the period of extended operation. The applicant stated that the program will be consistent with GALL AMP XI.M34, "Buried Piping and Tanks Inspection." By letters dated April 7, 2004 as revised by March 3, 2005 letter, February 24, 2005, and February 25, 2005, the applicant updated its AMP B.5.4 to be consistent with GALL AMP XI.M34 with exceptions.

The applicant stated that its Buried Piping and Tank Inspection Program will be used to manage the loss of material from the external surfaces of pressure-retaining buried carbon steel piping and tanks. Preventive measures have been put in place in accordance with standard industry practices for external coatings and wrappings. By letter dated April 7, 2004 as revised by March 3, 2005 letter, the applicant updated its program to include buried stainless steel and copper alloy piping components in the program scope. Also, by letters dated February 24, 2005 and February 25, 2005, the applicant stated that buried piping and tanks will be inspected within ten years after entering the period of extended operation, unless an opportunistic inspection has occurred within this ten-year period. Prior to the tenth year, the applicant will perform an engineering evaluation to determine if sufficient inspections have been conducted to draw a conclusion regarding the ability of the underground coatings to protect the underground piping and tanks from degradation. If not, the applicant will conduct a focused inspection to allow that conclusion to be reached.

Staff Evaluation

During its audit and review, the staff verified the applicant's claim of consistency with the GALL Report. The audit findings and conclusions are documented in the FNP Audit and Review Report. Furthermore, the staff reviewed the exceptions and the applicant's justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In its April 7, 2004 letter as revised by its March 3, 2005 letter, the applicant stated that it takes exception to the scope of the buried piping and tank inspection program in that the new buried piping and tank inspection program will also be used to manage the loss of material from the external surface of in-scope buried stainless steel and copper alloy piping during the period of extended operation. The staff reviewed the applicant's operating experience with respect to loss of material caused by corrosion of external surfaces of buried stainless steel and copper alloy piping and finds that stainless steel and copper alloy material are resistant to corrosion in a buried environment. On the basis of its review of operating experience and material environment combinations, the staff finds this exception to be acceptable.

The applicant also takes exception to the detection of aging effects program element in that the buried tanks and piping inspections are performed when the components are excavated for maintenance or for any other reason including investigation of a potential leak. By letters dated February 24, 2005 (SNC Letter No. NL-05-0340) and February 25, 2005 (SNC Letter No. NL-05-0366), the applicant provided LRA supplement. In its LRA supplement, the applicant stated that the buried piping and tanks will be inspected within ten years after entering the period of extended operation, unless an opportunistic inspection has occurred within this ten-year period. Prior to the tenth year, the applicant will perform an engineering evaluation to determine if sufficient inspections have been conducted to draw a conclusion regarding the ability of the underground coatings to protect the underground piping and tanks from degradation. If not, the applicant will conduct a focused inspection to allow that conclusion to be reached.

The staff reviewed the applicant's operating experience with excavations over the past few years, together with applicant’s letter dated April 7, 2004, and as revised by its letters dated February 24, 2005, February 25, 2005, and March 3, 2005, and finds that the frequency of excavating buried components for maintenance activities will be sufficient such that the effects of aging will be identified prior to the loss of intended function. Problems discovered in piping, requiring evaluation and reporting under the plant's corrective action program, may necessitate expanding the inspection scope. Excavating such components solely to perform inspections could pose an undue risk of damage to protective coatings. On the basis of its review, the staff finds this exception to be acceptable.

In its April 7, 2004 letter, and as revised by its March 3, 2005 letter, the applicant took an exception to the parameters monitored/inspected program element in that for uncoated/unwrapped piping, visual inspection will also be used to examine the external surfaces to confirm that no loss of material has occurred. The staff reviewed the applicant's exception, which applies to typically uncoated and unwrapped stainless steel and copper alloy piping, as well as the operating experience with excavations for copper alloy and stainless steel piping, and finds no instances of corrosion on the piping of these materials. On the basis of its review of applicant’s operating experience and the materials' resistance to corrosion in a buried environment, the staff finds this exception to be acceptable.

Also, in its April 7, 2004 letter, and as revised by its March 3, 2005 letter, the applicant took an exception to the acceptance criteria program element in that any loss of material in piping will also be reported and evaluated according to site corrective action procedures. The staff reviewed the applicant's exception, which applies typically to uncoated and unwrapped buried stainless steel and copper alloy piping in the open-cycle cooling water and fire protection systems, and the applicant's operating experience, and on the basis of its review, the staff finds this exception to be acceptable.

On the basis of its review of the applicant's letters dated April 7, 2004, and as revised by its letters dated February 24, 2005, February 25, 2005, and March 3, 2005, the staff finds that the applicant's exceptions to the GALL AMP XI.M34 to be acceptable.

Operating Experience

The applicant stated in the LRA that for the operating experience program element, the buried piping and tank inspection program is a new program. Therefore, no programmatic operating experience has been gained. However, the applicant will take into account, during the extended period of operation, lesson learned from performance of this program to confirm its effectiveness.

The staff reviewed the applicant's information related to buried piping and tanks. The staff recognizes that the corrective action program, which captures internal and external plant operating experience issues, will enable that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

FSAR Supplement

In Section A.2.16 of the LRA, the applicant provided the FSAR Supplement for the Buried Piping and Tank Inspection Program. By letter dated April 7, 2004, the applicant updated its FSAR Supplement to include buried stainless steel and copper alloy piping components in the program scope. By letter dated February 25, 2005, the applicant clarified its FASR Supplement commitment to the buried piping and tank inspection program. The staff reviewed this commitment and determined that the information in the FSAR supplement commitment provides an adequate summary of the program activities. The staff finds this FSAR supplement commitment sufficient.

Conclusion

On the basis of its audit and review of the applicant's program, the staff finds that those attributes of the program for which the applicant claimed consistency with the GALL Report program are consistent with the GALL Report program. In addition, the staff reviewed the exceptions to the GALL Report program and finds 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 FSAR supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Summary of Conclusion for AMPs That Are Consistent with the GALL Report, but with Exceptions and/or Enhancements

On the basis of its review and audit of the applicant's AMPs, the staff concludes that for the

AMPs listed above, 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 reviewed the associated FSAR Supplements for these AMPs and concludes that the FSAR Supplements provide an adequate summary description of the programs, as required by 10 CFR 54.21(d).

3.0.3.3 AMPs That Are Plant-Specific

In Appendix B to the LRA, the applicant indicated that the following AMPs were plant-specific:

- Flux Detector Thimble Inspection Program (B.5.2)
- External Surfaces Monitoring Program (B.5.3)
- NiCrFe Component Assessment Program (B.5.8)
- Periodic Surveillance and Preventive Maintenance Activities (B.5.9)

For AMPs that are not consistent with or not addressed by the GALL Report, the staff performed a complete review of the AMPs to determine if they were adequate to monitor or manage aging. The following sections document the staff's review of these plant-specific AMPs.

3.0.3.3.1 Flux Detector Thimble Inspection Program

The staff's regulatory basis for establishing the applicant's Flux Detector Thimble Inspection Program is given in NRC BL 88-09, "Thimble Tube Thinning in Westinghouse Reactors," dated July 26, 1988, which was addressed to all holders of operating licenses or construction permits for Westinghouse-designed nuclear reactors that utilize Bottom Mounted Instrumentation (BMI) nozzles. In this bulletin, the staff requested, in part, that each licensee addressed by the bulletin establish an inspection program for flux detector thimble tubes (henceforth referred to as "thimble tubes") with the following three program attributes:

(1) The establishment, with technical justification, of an appropriate thimble tube wear acceptance criterion (e.g., based on percent through-wall loss). The staff recommended that the acceptance criterion include allowances for such items as inspection methodology and wear scar geometry uncertainties.

(2) The establishment, with technical justification, of an appropriate inspection frequency (e.g., every refueling outage).

(3) The establishment of an inspection methodology that is capable of adequately detecting wear of the thimble tubes (e.g, eddy current testing).

<u>Summary of Technical Information in the Application</u>

In Section B.5.2 of Appendix B to the LRA, the applicant stated that the Flux Detector Thimble Inspection Program will be a formalization of the examination process currently performed at FNP, Units 1 and 2. The applicant implemented the current examination process in response to BL 88-09. The new Flux Detector Thimble Inspection Program will be used to identify loss of material resulting from fretting/wear in the thimble tubes during the periods of extended operation for FNP, Units 1 and 2.

The applicant's response to NRC BL 88-09, "Joseph M. Farley Nuclear Plant—Units 1 and 2, Thimble Tube Thinning in Westinghouse Reactors, NRC Bulletin 88-09," dated November 2, 1988, provides additional information regarding the Flux Detector Thimble Inspection Program.

Staff Evaluation

In Section B.5.2 of Appendix B to the LRA, the applicant described the Corrective Actions, Confirmation Process, and Administrative Controls program elements. Section 3.0.4 of this SER provides a separate evaluation of these three program elements. The remaining elements are evaluated below. The staff also included the applicant's response to NRC BL 88-09 within the scope of its evaluation. The staff also referred to information contained in the staff's January 12, 1990, BL 88-09 audit report, which documented the staff's followup audit on the applicant's BL 88-09 response.

[Program Scope] In Section B.5.2.3 of Appendix B to the LRA, the applicant stated that the Flux Detector Thimble Inspection Program will include the thimble tubes for both units. It does not include the instrument guide tubes, which are covered by the Inservice Inspection Program and the Reactor Vessel Internals Program.

In its response to BL 88-09, the applicant indicated that it had performed ECT inspections of 100 percent of the thimble tubes at FNP, Unit 1, during refueling outages (RFOs) 7 and 8 and at FNP, Unit 2, during RFO 5. The applicant's BL 88-09 response did not indicate whether the applicant would continue to perform 100 percent inspections of the thimble tubes during subsequent RFOs. The staff requested the applicant clarify whether it intended to continue to include ECT of 100 percent of the thimble tubes within the scope of the Flux Detector Thimble Inspection Program. The staff identified this request as RAI B.5.2-1.

The applicant provided the following response to RAI B.5.2-1 in its letter dated April 16, 2004 (SNC Letter No. NL-04-0617):

> All accessible flux thimble tubes are inspected using ECT at each scheduled inspection. Flux thimble tubes which have been previously capped, or which are obstructed, cannot be inspected. The flux thimble tubes are inspected over their full length from the seal table to the nose of the tube at the top of the core. SNC will continue to inspect all accessible flux thimble tubes at each scheduled inspection. See the response to RAI B.5.2-3 to address scheduling of these inspections.

In SNC Serial Letter No. NL-04-1396, dated August 5, 2004, the applicant provided a supplemental response to RAI B.5.2-1. In this supplement response, the applicant clarified that any thimble tube which is inaccessible for examination will be capped. Capping will prevent any potential through-wall leakage from tubes that cannot be examined. Since this will address any pressure boundary integrity issues in thimble tubes that cannot be examined, RAI B.5.2-1 is resolved and the applicant's Program Scope program attribute for the Flux Detector Thimble Inspection Program is acceptable.

[Preventive Actions] In Section B.5.2.4 of Appendix B to the LRA, the applicant stated that no preventive actions are associated with this monitoring program. The staff determined that the Flux Detector Thimble Inspection Program is an inspection-based condition monitoring program and that, as such, the program does not include preventive or mitigative actions to preclude the occurrence of an aging effect. On the basis of this determination, the staff concludes that the Preventive Actions program attribute is acceptable.

[Parameters Inspected or Monitored] In Section B.5.2.5 of Appendix B to the LRA, the applicant stated that it will conduct wall thickness measurements to detect loss of material from the flux detector thimbles. In its response to NRC BL 88-09, the applicant stated that the ECT vendor developed a calibration standard to include American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code standard defects, typical wear patterns, and service defects. Because ECT is a standard -NDE technique that is appropriate for the detection of wear, the staff concludes that the applicant's Parameters Inspected or Monitored program attribute is acceptable.

[Detection of Aging Effects] In Section 5.2.6 of Appendix B to the LRA, the applicant stated that ECT or other suitable examination methods will be used to detect loss of material from flux detector thimbles. In its response to NRC BL 88-09, the applicant stated it began performing ECT of the thimble tubes at FNP in 1986. The staff determined that the use of ECT is consistent with the inspection methodology specified in NRC BL 88-09. In its BL 88-09 audit report issued January 12, 1990, the staff concluded that the Flux Detector Thimble Inspection Program used acceptable inspection methods with technically justifiable acceptance criteria. However, the applicant's AMP description for the Flux Detector Thimble Inspection Program implies that the applicant may use alternative inspections to ECT. The staff requested that, if other inspection methods are used in lieu of ECT, the applicant clarify which alternative inspection methods it will use for the thimble tube examinations and how the alternative inspection methods, if used, will be qualified as being capable of detecting loss of material/wear in the thimble tubes. The staff identified this request as RAI B-1.

The applicant provided the following response to RAI B-1 in a letter dated April 16, 2004 (SNC Letter No. NL-04-0617):

> Eddy current testing (ECT) is the technique currently used to determine the amount of wear on flux thimble tubes. Other volumetric examination techniques are not currently credited as alternatives to eddy current testing. If other volumetric examination techniques become available in the future, SNC reserves the option to revise the Flux Detector Thimble Inspection Program to perform inspections using qualified techniques. SNC will continue to participate in Westinghouse Owner's Group (WOG) activities related to flux detector thimble inspection. When issued, any WOG recommended actions, including changes to qualified inspection methods, will be reviewed and the Flux Detector Thimble Inspection Program modified, as appropriate. This is consistent with the November 2, 1988 response to NRC Bulletin 88-09 for FNP.

The applicant's response clarifies that ECT is the normal inspection method used for these examinations and confirmed that only ECT will be used as the method for the examinations, unless other acceptably qualified volumetric examination techniques are proposed by the WOG for inspecting the thimble tubes. To date, the applicant uses ECT as the qualified technique for inspecting the thimble tubes. The staff recommended this acceptable technique in NRC BL 88-09. Because the applicant will use only acceptably qualified volumetric examination techniques to detect wear in the thimble tubes, the staff concludes that the applicant has proposed acceptable inspection methods for managing this aging effect and that the Detection of Aging Effects program attribute is acceptable. Therefore, RAI B-1 is resolved.

[Monitoring and Trending] In Section 5.2.7 of Appendix B to the LRA, the applicant stated that it will trend ECT results and calculate wear rates. Wear predictions will dictate the examination frequency. In its response to NRC BL 88-09, dated November 2, 1988, the applicant stated that the program will include ECT at each RFO until it establishes adequate confidence in wear rate projections. In its BL 88-09 audit report issued on January 12, 1990, the staff stated that the inspection frequency of every RFO is acceptable. However, during the LRA audit of November 3–7, 2003, the staff determined that the applicant is basing its implementation of the Flux Detector Thimble Inspection Program on WCAP-12866[3], "Bottom Mounted Instrument Flux Thimble Wear," dated January 11, 1991. The staff requested confirmation that WCAP-12866 does not change the inspection frequency for the Flux Detector Thimble Inspection Program from that approved in the BL 88-09 audit report of January 12, 1990. The staff identified this request as RAI B.5.2-3

The applicant provided the following response to RAI B.5.2-3 in its letter dated April 16, 2004 (SNC Letter No. NL-04-0617):

> In the November 2, 1988 response to NRC Bulletin 88-09 for FNP, Alabama Power Company stated "Alabama Power Company will continue to monitor thimble tube wear by periodic testing and will participate in Westinghouse Owner's Group (WOG) activities to establish recommended testing options, acceptance criteria, and recommended corrective actions. *When issued, the WOG recommended actions will be reviewed and the Alabama Power Company program modified, as appropriate.* In the interim period prior to issuance of the WOG recommendations, Alabama Power Company will continue with its current program which is consistent with the requirements of NRC Bulletin 88-09" (emphasis added).
>
> In its January 12, 1990 audit trip report, the NRC noted that "The Licensee stated that eddy current inspections will be performed during every refueling outage *until there is sufficient data to justify longer inspection intervals"* (emphasis added). In addition, the NRC concluded: "The Licensee has considered long term corrective actions and is prepared to replace tubes if necessary. Although no long term commitments have been made, we understand that the Licensee will continue participating in industry programs (such as WOG) and follow new developments related to this issue."
>
> The FNP Flux Detector Thimble Inspection Program has been maintained in accordance with the November 2, 1988 response to NRC Bulletin 88-09, including the potential for modifications to the inspection interval. This potential for modifications to the inspection interval was acknowledged by the NRC in its January 12, 1990 audit trip report.
>
> The inspection schedule implemented by the FNP Flux Detector Thimble Inspection Program is in conformance with the current recommendations of WCAP-12866, "Bottom Mounted Instrument Flux Thimble Wear" dated January 11, 1991. The inspection schedule is not a pre-established, fixed frequency. The inspection schedule is variable, based on projections of thimble tube wear calculated from measurements of current wear. Early in the inspection program, inspections were performed every outage to establish wear rate patterns characteristic of each unit. Once a history had been established, the WCAP-12866 wear rate projection methodology became the basis for determining the acceptable interval between inspections. After each inspection the recommended

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[3] Westinghouse WCAP-12866 is a Class 2 Proprietary Westinghouse Report. In NRC BL 88-09, the staff specifically stated, in part, that "each addressee is requested to establish an inspection program to monitor thimble tube performance, that includes the establishment, **with technical justification** [emphasis added], of an appropriate thimble tube wear acceptance criterion."

The 80 percent through-wall wear acceptance criterion established in the report is not considered by the NRC to be proprietary in content because the staff did not intend this type of information to be withheld from the public when it issued NRC BL 88-09. Further, this type of information has been divulged to the general public in the past in other industry correspondence, NRC correspondence, NRC audit reports, and safety evaluations. However, the remaining specific data, equations, and information are considered to be proprietary in content and will be withheld from the public, in accordance with the staff's acceptance of Westinghouse Electric Company's Proprietary Affidavit on WCAP-12866. Therefore, only a general basis on the acceptability of Westinghouse's 80 percent through-wall wear acceptance criterion will be given in this SER.

date of the next inspection is determined. Operating experience at FNP and across the industry indicates that the wear rate prediction methodology is a conservative way to project wear of the flux thimble tubes.

In 1993 the schedule of inspections at FNP was changed from every outage to every other outage, unless wear predictions dictated that an inspection be scheduled at an earlier date. This change was based on Westinghouse's recommendation.

The FNP Unit 2 flux thimble tubes are currently inspected every other outage in accordance with WCAP-12866 guidance. The last inspection was performed during the Fall 2002 refueling outage (2R15). The next inspection is scheduled for the Fall 2005 refueling outage (2R17). Planning activities are in progress to replace the Unit 2 flux thimble tubes. After the flux thimble tubes are replaced the inspection schedule will be revised in accordance with the latest guidance based on WCAP-12866, and industry and FNP operating experience.

The FNP Unit 1 flux thimble tubes were replaced with wear resistant, chrome plated thimble tubes during the Fall 1998 refueling outage (1R15). In 2003 the inspection schedule was extended to every third refueling outage based on Westinghouse's recommendation. The last inspection was performed during the Fall 2001 refueling outage (1R17). The next inspection is scheduled for the Spring 2006 refueling outage (1R20).

The current inspection schedules for FNP Units 1 and 2 are established based on predictions of flux thimble tube wear. These predictions are calculated in accordance with the methodology described in WCAP-12866. The unit-specific wear history is used as input to the wear calculation. Both industry and FNP specific operating experience is considered when the date for the next inspection is established. This experience confirms that the WCAP-12866 methodology is a conservative way to manage wear of flux thimble tubes.

The applicant's supplemental response to RAI B.5.2-3, by letter dated June 25, 2004 (SNC Letter No. NL-04-1096), provides the following clarifications:

- The response confirms that the applicant is using the methodology in WCAP-12866 as the current basis for implementing its Flux Detector Thimble Inspection Program.

- The applicant is currently inspecting the FNP Unit 2 thimble tubes once every other RFO (i.e., once every 36 months), with the last inspection having been performed during RFO 15 in 2002.

- The applicant replaced the thimble tubes at FNP, Unit 1, during the 1998 RFO (RFO 1R15) with thimble tubes fabricated with chromium plating; the applicant inspected the new thimble tubes at FNP, Unit 1, for the first time in 2001 during RFO 1R17.

- The applicant will perform the second inspection of the new thimble tubes at FNP, Unit 1, in 2006 during RFO 1R20.

In WCAP-12866, Westinghouse compiled plant-specific wear rate data from Westinghouse-designed thimble tubes on behalf of participating members in the WOG. Westinghouse used its generic compilation of thimble tube wear data to derive a generic wear rate equation for Westinghouse-designed thimble tubes. The WOG, to date, has not requested that this topical report be formally reviewed by the staff nor has the staff endorsed this report for use. In NRC BL 88-09, the staff stressed that monitoring programs for Westinghouse-designed thimble tubes would be based on actual plant-specific wear data. Thus, application of the methodology and generic wear data in WCAP-12866 may not be conservative if a facility's plant-specific data project wear at a faster rate than would be projected by the report's generic data. In its review of the applicant’s response to RAI B.5.2-3, the staff noted that the response did not clarify whether the FNP Unit 2-specific wear data were being used to support the inspection frequency for FNP Unit 2 thimble tubes. The staff also noted that new thimble tubes at FNP, Unit 1, are currently scheduled for inspection once every three RFOs and had only been inspected once in 1998.

During a conference call held June 7, 2004, the staff requested additional information on the wear rate data that the applicant used to predict future wear in the FNP Unit 2 thimbles tubes over an 18-month operating period. The staff also requested information on the applicant’s basis for establishing an inspection frequency for the FNP Unit 1 thimble tubes subsequent to the second ECT in 2006. The applicant addressed these questions by supplementing its response to RAI B.5.2-3 with additional information in its letter dated July 16, 2004 (SNC Letter No. NL-04-1296). In its letter dated June 25, 2004 (SNC Letter No. NL-04-1096), the applicant provided the following supplemental information:

> For the Unit 2 thimble tubes:
>
> - The worst case cumulative wear (for thimble tubes which have not been repositioned or capped) from the most recent Unit 2 inspection (U2R15) data (adjusted for uncertainty) was 58.8% for thimble tube J03 at 985.94" from the seal table. A 5% allowance for instrument error was applied to the measured wear data.
>
> - Nominal wall thickness of the Unit 2 thimble tubes is 0.049 +/- 0.002 inches.
>
> - For FNP, the methodology provided in Proprietary Class 2 WCAP-12866 is used to project thimble tube wear at the end of future operating cycles. Unit-specific measured wear data is adjusted for uncertainty and is input to the WCAP-12866 methodology to establish the curve coefficient (i.e., exponent “n”) and determine the curve-fit representing thimble tube wear over time. The next inspection is scheduled for an outage before any thimble tubes are projected to exceed the acceptance criteria for wall loss, with consideration of plant and industry experience with thimble tube wear. This process is repeated after each inspection, therefore the inspection interval is re-evaluated after each inspection.
>
> The.... coefficient.... used in the latest projection of flux thimble tube wear was 0.302…. For the worst case cumulative wear (for thimble tubes which have not been repositioned or capped) from the U2R15 inspection, this equates to wear projections of 60.10% at the end of cycle 16, and 61.33% at the end of cycle 17.
>
> LRA Appendix B, Section B.5.2.12, indicated that no Unit 2 flux thimble tubes would require repositioning or capping based on the latest data, and the initial response to RAI B.5.2-3 noted that the next Unit 2 eddy current inspection was scheduled for U2R17 (Fall ‘05). During U2R16 (Spring ‘04), five thimble tubes were re-positioned and one was capped. SNC is currently considering the option of eliminating the eddy current inspection scheduled for U2R17 based on the additional margin provided by the repositioning and capping. This would allow Unit 2 to operate until U2R18 without further eddy current inspection. The Unit 2 thimble tubes will be inspected or replaced at U2R18. The decision to eliminate the U2R17 eddy current inspection will include evaluation of thimble tube wear projections performed in accordance with the WCAP-12866 methodology.

By dated June 25, 2004 (SNC Letter No. NL-04-1096), the applicant projected, in part, that the worst case amount of wear in the FNP Unit 2 thimble tubes would be 63.3 percent of the nominal wall thickness through RFO 18.

The applicant’s supplemental response to RAI B.5.2-3 clarifies that the nominal wall thickness for the FNP Unit 2 thimble tubes is 0.049 inches and that the worst case amount of wear in these thimble tubes was approximately 59 percent of the nominal wall thickness, including a 5 percent allowance in the wear value to account for instrument uncertainties in the ECT measurements. The response also clarifies that the applicant is using plant-specific FNP Unit 2 thimble tube data taken from past ECT examinations, and not the generic data, as the basis for projecting the wear in FNP Unit 2 thimble tubes through the completion of operating cycles 16 and 17, and potentially through the completion of operating cycle 18. The applicant has currently scheduled the next inspection of the FNP Unit 2 thimble tubes for RFO 17, but is considering deferring the inspections until RFO 18 (which will be scheduled for Spring 2007). The results from ECT examinations performed during RFO 15 project that the worst case wear in the FNP Unit 2 thimble tubes will be 63.3 percent of the wall thickness through RFO 18. This is less than the acceptance criterion used by the applicant for evaluating wear thimble tubes (i.e., 80 percent of the thimble tube wall thickness; refer to the evaluation of the Acceptance Criteria program attribute for this AMP) and supports an inspection frequency of once every 3 cycles based on the plant-specific wear result data from FNP, Unit 2, RFO 15. The applicant's responses in its letters dated April 16, 2004 (SNC Letter No. NL-04-0617) and June 25, 2004 (SNC Letter No. NL-04-1096) also demonstrate that the applicant is taking acceptable corrective actions for thimble tubes that are projected to wear beyond the acceptance criterion before the next inspection. Because the applicant is applying the FNP, Unit 2, specific data to project the amount of wear occurring in the FNP Unit 2 thimble tubes through RFO 18, and because the applicant is taking acceptable corrective action for thimbles tubes that cannot be used for further service, the staff concludes that inspecting the FNP Unit 2 thimble tubes once every 3 RFOs is acceptable.

The applicant's response dated April 16, 2004 (SNC Letter No. NL-04-0617) indicated that the applicant had replaced the FNP Unit 1 thimble tubes in 1998 and has only inspected them once. The applicant has scheduled the second examination of the FNP Unit 1 thimble tubes for the facility's 2006 RFO, which is within 2 years of the issuance of the renewed operating license for the facility. In a letter dated June 25, 2004 (SNC Letter No. NL-04-1096), the applicant committed to submitting the same type of inspection result information for the new FNP Unit 1 thimble tubes that it submitted to support the inspections of the FNP Unit 2 thimble tubes during either RFO 17 or 18 (i.e., inspect on a frequency of either once every other RFO, if inspecting during RFO 17, or once every third RFO if inspecting during RFO 18). This commitment will enable the staff to confirm that the inspection frequency for the new FNP Unit 1 thimble tubes is consistent with the basis used to establish the inspection frequency for the FNP Unit 2 thimble tubes and is therefore acceptable.

Based on this technical evaluation, the staff concludes that the applicant is applying plant-specific ECT examination data as the basis for projecting the amount of wear in the thimble tubes through the next scheduled examinations, as well as for establishing the inspection frequencies for the thimble tubes at FNP, Units 1 and 2. Because this is consistent with the staff's recommendations in NRC BL 88-09, the staff concludes that the applicant's Monitoring and Trending program attribute for the Flux Detector Thimble Inspection Program is acceptable.

[Acceptance Criteria] In Section 5.2.8 of Appendix B to the LRA, the applicant stated that it will evaluate the results of the thimble tube inspections using a wear rate formula to determine the earliest projected date that a thimble tube can be anticipated to exceed the wall thickness limit.

In its BL 88-09 audit report issued on January 12, 1990, the staff stated that the inspection program applied acceptable state-of-the-art inspection methods with technically justifiable wear acceptance criteria. In the BL 88-09 audit report, the staff determined that the applicant based its evaluations of wear on an acceptance criterion of 65 percent through-wall wear in the thimble tubes. However, during the staff's LRA audit of November 3–7, 2003, the staff determined that the applicant is presently using WCAP-12866 as its basis for the Flux Detector Thimble Inspection Program. This WCAP includes a through-wall acceptance criteria of 80 percent. The staff requested that the applicant provide a technical basis for changing the acceptance criterion for the Flux Detector Thimble Inspection Program from 65 percent through-wall wear and for concluding that an acceptance criterion of 80 percent through-wall wear will maintain the component intended functions of the thimble tubes. The staff identified this request as RAI B.5.2-4.

The applicant provided the following response to RAI B.5.2-4 in its letter dated April 16, 2004 (SNC Letter No. NL-04-0617):

> FNP is committed to monitor thimble tube wear by periodic testing and to participate in Westinghouse Owner's Group (WOG) activities to establish recommended testing options, acceptance criteria, and recommended corrective actions. The 65% through-wall acceptance criterion was the preliminary acceptance criterion established based on Westinghouse analysis and acknowledged by the NRC in its January 12, 1990, audit trip report. The NRC acknowledged that "The Licensee is participating in the Westinghouse Owner's Group (WOG) Program on thimble tube wear. This program will develop more accurate wear scar standards and refine the acceptance criteria for wear based on testing of tube samples from operating plants."
>
> In January 1991, Westinghouse issued WCAP-12866, "Bottom Mounted Instrumentation Flux Thimble Wear." This WCAP established a refined acceptance criterion of 80% through-wall wear. The refined acceptance criterion included results from testing of tube samples. WCAP-12866 concludes that flux thimbles have a high residual strength even when subject to wall loss on the order of 90%, and that the thimbles will maintain their functional and structural integrity with up to 85% wall loss for all operating modes. The WCAP recommends an acceptance criterion of 80% through-wall wear be used for conservatism. Uncertainties inherent in the eddy current examination process were considered in the development of the acceptance criteria.
>
> The Staff question also requests an assessment of whether the acceptance criterion includes an allowance to take into account wear that is projected to occur in the interval between examinations. Since the 80% acceptance criterion is applied to the wear which is projected to exist at the next inspection, wear in the interval between inspections is accounted for. Appropriate corrective action will be taken for flux thimble tubes which are projected to exceed the acceptance criteria before the next inspection.

In NRC BL 88-09, the staff requested each licensee "to establish an inspection program to monitor thimble tube performance, that includes the establishment, with technical justification, of an appropriate thimble tube wear acceptance criterion (for example, percent through-wall loss)."

The staff reviewed WCAP-12866 and determined that the acceptance criterion in the topical report was based on conservative burst tests on Westinghouse thimble tube designs that support an 80 percent through-wall acceptance criterion for the thimble tubes at FNP, Units 1 and 2. This value includes an additional safety margin established by Westinghouse for allowable wear in the thimble tube. This safety margin, however, does not include an allowance for instrument uncertainties, which, as a percentage of the wall thickness, must be accounted for by either adding it to the ECT wear result data or subtracting it from the acceptance criterion.

As indicated in its supplemental response to RAI B.5.2-3, the applicant accounts for the instrument uncertainties in its wear assessments for the thimble tubes by adding the instrument uncertainties to wall measurement data after the ECT examinations have been performed. Therefore, the applicant opts to add the instrument uncertainty (which the applicant sets at 5 percent of the FNP thimble tube-wall thickness) into the wear result data after ECT examinations are performed. This is acceptable. The staff concludes that the applicant's 80 percent through-wall acceptance criterion is acceptable because it is based on conservative burst tests for the thimble tubes and it includes an acceptable safety margin for allowable wear. Therefore, the staff concludes that the Acceptance Criteria program attribute for the Flux Detector Thimble Inspection Program is acceptable and RAI B.5.2-4 is closed.

[Operating Experience] In Section 5.2.12 of Appendix B to the LRA, the applicant stated that there is industry-specific and plant-specific history related to loss of material from thimble tubes in Westinghouse reactors. The applicant also stated that the presence of wear has been detected in multiple thimble tubes at FNP and that SNC replaced the FNP Unit 1 thimble tubes during RFO 15 with chrome-coated, strain-hardened stainless steel thimbles. For FNP, Unit 2, the applicant indicated that the most recent flux thimble eddy current evaluation indicates that no repositioning or capping will be required.

NRC BL 88-09 documents industry experience with wear in thimble tubes of Westinghouse-designed light-water reactors. The Flux Detector Thimble Inspection Program is based on the applicant's response to NRC BL 88-09, dated November 2, 1988. The original FNP thimble tubes were fabricated from SA213, Type 316 austenitic stainless steel that was cold drawn and heat treated.

The staff's BL 88-09 audit report of January 12, 1990, provides early documentation of FNP-specific wear degradation in the thimble tubes. In the BL 88-09 audit report, the staff documented the results of ECT inspections performed on the thimble tubes at FNP, Unit 1, during RFOs 7, 8, and 9, and at FNP Unit 2 during RFOs 5 and 6. In the BL 88-09 audit report, the staff also reported that the wear detected in some of the thimble tubes at FNP, Unit 1 (ranging from 17 percent to 67 percent through-wall degradation), was more significant than the wear reported in some thimble tubes at FNP, Unit 2 (ranging from 13 percent to 53 percent through-wall degradation), which warranted corrective action by the applicant, based on an original acceptance criterion of 65 percent through-wall degradation. This operating experience indicates that the applicant's implementation of the Flux Detector Thimble Inspection Program is achieving its intended purpose of protecting the intended functions of the thimble tubes. The applicant also indicated that the original thimble tubes at FNP, Unit 1, were replaced during RFO 15 with thimble tubes fabricated from chrome-coated, strain-hardened stainless steel.

The staff requested clarification as to whether the applicant used wear experience and change in the material of fabrication for the thimble tubes at FNP, Unit 1, as a basis for revising both the scope of the program, as related to frequency and number of thimble tubes inspected, and the acceptance criterion for evaluating the results of inspections performed on the thimble tubes at FNP, Unit 1. The staff identified this request as RAI B.5.2-5.

The applicant provided the following response to RAI B.5.2-5 in its letter dated April 16, 2004 (SNC Letter No. NL-04-0617):

> The Program Scope (B.5.2.3), Monitoring and Trending (B.5.2.7), and Acceptance Criteria (B.5.2.8) have not been revised due to the wear experience or the change in the material of fabrication for the thimble tubes at Farley, Unit 1. All flux thimble tubes on both Units are in the scope of the program. Wall thickness measurements will be conducted to detect loss of material from the

> thimble tubes at both Units. Examination results will be trended and wear rates will be calculated in accordance with WCAP-12866 for both Units. Examination frequency will be based on wear predictions. Results of the wall thickness measurements will be evaluated using a wear rate formula which is described in WCAP-12866. The wear rate formula will be used to determine the earliest projected date that a flux detector thimble tube can be anticipated to exceed the wall thickness limit. This determination is performed in accordance with WCAP-12866 for both units. The program attributes of the Flux Detector Thimble Inspection Program are therefore the same for both Units.

The applicant's response to RAI B.5.2-5 indicates that, following the 2006 ECT examinations, the applicant will use the inspections of the new FNP Unit 1 thimble tubes and apply the methods of WCAP-12866 as the basis for establishing the inspection frequency for these components. In its supplemental response to RAI B.5.2-3, the applicant committed to provide the wear results and wear rate projection data to the staff following the second inspection of the new FNP Unit 1 thimble tubes in 2006, as well as their inspection frequency. The applicant's response to RAI B.5.2-5 is consistent with this commitment and the applicant's commitment responses to BL 88-09, and is therefore acceptable. On the basis of this determination, the staff concludes that the Operating Experience program attribute is acceptable and RAI B.2.5-5 is resolved.

<u>FSAR Supplement</u>

In Section A.2.14 of Appendix A to the LRA, the applicant provided the following FSAR Supplement for the Flux Detector Thimble Inspection Program:

> The new Flux Detector Thimble Inspection Program will be implemented prior to entering the period of extended operation to formalize examinations already being performed. The program will be administratively controlled by plant procedures. It will be used to identify loss of material during the extended period of operation.

The FSAR Supplement summary description indicates that the Flux Detector Thimble Inspection Program will be implemented during the period of extended operation. The applicant is currently implementing this program as a BL 88-09 program that was established in response to commitments made by the applicant in response to NRC BL 88-09. In NRC BL 88-09, the staff anticipated that licensees owning Westinghouse-designed PWRs would use plant-specific data from thimble tube ECT examinations to develop the inspection frequencies for their thimble tubes, and that the time between examinations could be increased if warranted by the results of the thimble tube examinations.

In its response to BL 88-09, the applicant committed to implementing a qualified inspection program for the FNP thimble tubes that would be adjusted accordingly based on the wear results of volumetric examinations performed on the thimble tubes. The applicant is appropriately using its plant-specific wear rate results to establish the inspection frequencies for the thimble tubes at FNP, Units 1 and 2. The applicant will use any wear results from additional ECT examinations performed before the period of extended operation to adjust the wear rate projections and inspection frequencies for the thimble tubes. This is consistent with the staff's recommendations in NRC BL 88-09 and with the applicant's commitments made in response to NRC BL 88-09, which will carry over into the period of extended operation for FNP, Units 1 and 2. The applicant's FSAR Supplement summary description for the Flux Detector Thimble Inspection Program is a general description of this process. Because the process described in the FSAR Supplement for this AMP is consistent with the recommendations of NRC BL 88-09, the staff concludes that the FSAR Supplement for the Flux Detector Thimble Inspection Program is acceptable.

Conclusion

On the basis of its review of the applicant's program, 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 FSAR Supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.2 External Surfaces Monitoring Program

Summary of Technical Information in the Application

In Section B.5.3 of Appendix B to the LRA, the applicant stated that the External Surfaces Monitoring Program is a new plant-specific condition monitoring program that it will implement at FNP, Units 1 and 2 prior to the period of extended operation. This new program will identify loss of material caused by corrosion or wear of external surfaces of carbon steel, low-alloy steel, and other susceptible materials in components that require aging management for license renewal.

Staff Evaluation

[Program Scope] In Section B.5.3.4 of Appendix B to the LRA, the applicant stated that the new program will manage accessible and insulated susceptible external surfaces of components that are within the scope of license renewal. Such susceptible external surfaces include carbon steel and low-alloy steel surfaces located within both inside and outside environments, and galvanized steel, cast iron, copper alloys, and aluminum surfaces located in outside environments. The new External Surfaces Monitoring Program will also manage the loss of material, cracking, and the change of material properties in elastomers. The staff determined that the program scope includes the components for which the program manages aging. On the basis of this determination, the staff concludes that the program scope is acceptable.

[Preventive Actions] In Section B.5.3.5 of Appendix B to the LRA, the applicant stated that, while monitoring activities will include actions to monitor and report conditions, no preventive actions are associated with this monitoring program. The staff determined that the External Surfaces Monitoring Program is an inspection-based condition monitoring program and that, as such, the program does not require preventive or mitigative action to preclude the occurrence of an aging effect. On the basis of this determination, the staff concludes that the preventive actions are acceptable.

[Parameters Inspected or Monitored] In Section B.5.3.6 of Appendix B to the LRA, the applicant stated that it will observe the surface conditions of selected components to detect the loss of material due to corrosion or wear; accessible portions of piping or tubing to detect the loss of material due to fretting, flange leakage, missing or damaged insulation, or damaged coatings; and accessible in-scope elastomers to detect age-related degradation.

The staff determined that the parameters inspected are linked to the degradation of the component intended function and should detect the presence and extent of the aging effects. On the basis of this determination, the staff concludes that the parameters inspected or monitored are acceptable.

[Detection of Aging Effects] In Section B.5.3.7 of Appendix B to the LRA, the applicant stated that it will perform visual inspections to examine all accessible portions of the systems. The staff recognized that visual examination is an appropriate method to detect corrosion, but cannot be used in isolation to quantify corrosion. In RAI 3.4-7, the staff requested the applicant to explain how it will manage loss of material on the exterior bottom surface of the CST which is not accessible for visual inspection. In its response dated March 5, 2004, the applicant stated that it will revise the One-Time Inspection Program to include a thickness measurement of the bottom of the Unit 1 CST before the period of extended operation. The exterior bottom surfaces of the auxiliary steam condensate tanks and condensate return unit tanks are accessible for visual inspection. Based on the applicant's response, the staff finds the one-time inspection of the CST bottom acceptable to manage this aging effect. When visual examination detects corrosion, it would then use supplemental examination methods (i.e., surface or volumetric) to quantify the degree of corrosion. The staff determined that the use of visual inspection to observe surface condition is an acceptable means to detect corrosion and age-related degradation. On the basis of this determination, the staff concludes that the detection of aging effects is acceptable.

[Monitoring and Trending] In Section B.5.3.8 of Appendix B to the LRA, the applicant stated that it will establish baseline documentation of the condition of the managed surfaces before the beginning of the period of extended operation. The applicant will use existing information on these surfaces to establish baseline documentation, or if no historical data are available, the applicant will perform a baseline inspection. The applicant will monitor and trend degradation of external surfaces in accordance with established procedures and guidelines. Inspection frequency will be subject to modification based on plant-specific environments and observed degradation. The applicant will either increase or decrease Inspection frequency for a specific system, component, or area, as necessary, to preclude component failures. The staff determined that this monitoring and trending element describes date collection and trending to provide predictability of degradation. On the basis of this determination, the staff concludes that monitoring and trending element is acceptable.

[Acceptance Criteria] In Section B.5.3.9 of Appendix B to the LRA, the applicant stated that acceptance criteria will be contained in the applicable inspection procedures, and that these criteria will be directly correlated to the indications of aging effects. By RAI B.5.3-1, staff requested the applicant to discuss the criteria to determine acceptability during these inspections. In its response dated March 5, 2004, the applicant stated that acceptance criteria are to be commensurate with industry code, standards and guidelines, and are to also consider industry and plant-specific operating experience. Where practical, acceptance criteria will be specifically tailored to the component type, materials of construction, and expected aging effects. Inspection criterial may include flaking or peeling of paint, rust, scale, rust stains, cracking or visible leakage. Acceptance criteria will ensure an inspected component does not exhibit any visible indications that could result in a failure of component to perform its intended function prior to the next inspection, and will identify if corrective action is needed. The evaluation criteria will consider not only the current severity of the degradation, but the expected environmental aggressiveness of the area surrounding the component.

The staff determined that the acceptance criteria of industry code, standards, and guidelines described by the applicant provide adequate criteria against which to evaluate the need for corrective actions. On the basis of this determination, the staff concludes that the acceptance criteria are acceptable.

[Operating Experience] In Section B.5.3.13 of Appendix B to the LRA, the applicant stated that there is no programmatic operating experience for this program. There are non-nuclear industry and other related histories related to the loss of material of external surfaces and of age-related degradation of elastomer hoses, but the lack of this operating experience should not preclude implementation of this program. The use of conservative acceptance criteria and liberal corrective actions will accomplish an effective AMP.

The staff determined that the applicant's review of operating experience was adequate, and that it is an addition to or duplicates that of other programs that the staff has reviewed and approved. On the basis of this determination, the staff concludes that operating experience is acceptable.

FSAR Supplement

In Section A.2.15 of Appendix A to the LRA, the applicant provided its FSAR Supplement for the External Surfaces Monitoring Program. The staff reviewed the FSAR Supplement and found that the summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d) and is acceptable.

Conclusion

On the basis of its review of the applicant's program, 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 FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.3 NiCrFe Component Assessment Program

Summary of Technical Information in the Application

Section B.5.8 of Appendix B to the LRA discusses the NiCrFe Component Assessment Program. The applicant stated that the NiCrFe Component Assessment Program will be developed to address industry concerns regarding the potential for PWSCC in nickel alloy components exposed to the reactor coolant environment. The new program will assess the susceptibility of nickel-based alloy components to PWSCC and provide for any required augmented inspection requirements to ensure that the component functions will be maintained during the period of extended operation. The applicant stated that, based on the results of nickel alloy component assessments, the inspections normally accomplished under the FNP Inservice Inspection and Borated Water Leakage Assessment and Evaluation Programs may be enhanced with additional inspection activities. The applicant stated that it supports development of improved industry data, models, and inspection methodologies through active participation in the EPRI MRP Alloy 600 Issue Task Group (ITG) and the WOG.

Staff Evaluation

In accordance with 10 CFR 54.21(a)(3), the staff reviewed the NiCrFe Component Assessment Program to determine if the program demonstrated, through objective evidence, that the effects of aging from various age-related degradation mechanisms will be adequately managed so that the intended function of the components comprised of nickel-based alloys will be maintained consistent with the CLB for the period of extended operation. Because the applicant has yet to develop the NiCrFe Component Assessment Program, the staff used Aging Management Review—Generic, Branch Technical Position (BTP) RLSB-1, under the SRP-LR, as the guidance to evaluate the elements of the program.

GL 97-01, “Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Head Penetrations,” dated April 1, 1997, provides the staff's original basis for inspecting Alloy 600 reactor vessel head penetration nozzles in U.S. PWRs. Between November 2000 and April 2001, RCPB leakage was identified from the reactor vessel head penetration nozzles of four U.S. PWR light-water reactor facilities. Supplemental examinations of the degraded nozzles indicated the presence of circumferential cracks in four of the control rod drive mechanism (CRDM) nozzles. These cracks initiated from the outer surface of the nozzle, either in the associated J-groove weld or heat-affected zone, and not from the inside surface of the nozzle, as the industry responses to NRC GL 97-01 assumed. These cracks penetrated through the nozzles and were the first identified instances of circumferential cracking in U.S. reactor vessel head penetration nozzles. In NRC BL 2001-01, ”Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles,” dated August 3, 2001, the staff discussed the generic safety significance and impact of these cracks on reactor vessel head penetration nozzles and recommended that enhanced visual examination or volumetric examination methods be used for the inspection of these components.

In March 2002, during a refueling outage at the Davis-Besse Nuclear Power Station, the licensee reported the occurrence of reactor coolant leakage from a reactor vessel head penetration that resulted in significant boric acid-related wastage of the reactor vessel head. The wastage affected the entire thickness of a localized area of the reactor vessel head around a penetration nozzle, with the exception of its cladding. On March 18, 2002, the NRC issued NRC BL 2002-01" to owners of PWR designs, requesting that the licensees address the impact of the Davis-Besse event on the structural integrity of their reactor vessel heads and associated penetration nozzles. On August 9, 2002, the staff issued NRC BL 2002-02, “Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs,” to address additional technical issues resulting from the Davis-Besse event. In NRC BL 2002-02, the staff specifically suggested that further augmented inspections, more comprehensive than those suggested in NRC BL 2001-01, be performed on reactor vessel head penetration nozzles. On February 11, 2003, the staff issued Order EA-03-009, “Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads At Pressurized Water Reactors,” to further define to licensees the frequency and extent of examination of nickel-based alloys and welds in the reactor pressure vessel (RPV) heads due to PWSCC. On August 21, 2003, the staff issued NRC BL 2003-02, “Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity,” to advise licensees that RPV lower head inspections may need to be supplemented with additional measures to assure RCPB leakage is detected. On February 23, 2004, the staff issued First Revised Order EA-03-009, to modify the inspection requirements for reactor pressure vessel heads at PWRs.

During V.C. Summer refueling outage 12 (October 2000), a through-wall crack was identified in the RV hot-leg nozzle safe-end weld. This weld was fabricated from Alloy 82/182 weld material. NRC INs 2000-17 and 2000-17, Supplement 1, dated October 18, 2000, and November 16, 2000, respectively, provide details of the V.C. Summer RV hot-leg nozzle weld-cracking event. Because the V.C. Summer main coolant loop weld-cracking event involves Alloy 82/182 weld material, the staff has been addressing the effect of PWSCC on Alloy 82/182 piping welds on a generic basis for all currently operating PWR plants. To resolve this current operating issue, the industry is taking the initiative to (1) develop overall inspection and evaluation guidance, (2) assess the current inspection technology, and (3) assess the current repair and mitigation technology. An interim industry report, "PWR Materials Reliability Project Interim Alloy 600 Safety Assessment for US PWR Plants (MRP-44), Part 1: Alloy 82/182 Pipe Butt Welds," was published in April 2001 to justify the continued operation of PWR plants while the industry completes the development of the final report. The staff documented its acceptance of this interim report in an SE issued June 14, 2001. The final industry report on this issue has not yet been published. Pending its receipt of the final report and additional ultrasonic testing (UT) inspection data from piping involving Alloy 82/182 weld material from the industry, the staff is pursuing resolution of this current operating issue pursuant to 10 CFR Part 50.

Under Appendix A2.18 to the LRA, the applicant stated that it will implement the new NiCrFe Component Assessment Program before the period of extended operation. In its commitment, the applicant stated that the NiCrFe Component Assessment Program will be developed to address industry concerns regarding the potential for PWSCC in nickel alloy components exposed to the reactor coolant environment. This new program will assess the susceptibility of nickel-based alloy components to PWSCC and provide for any required augmented inspection requirements to ensure that the component functions will be maintained during the period of extended operation. The FNP program scope includes nickel-based alloy RCPB components with known or potential susceptibility to PWSCC, excluding SG tubes (which are specifically addressed by the Steam Generator Program) and reactor internals (which are specifically addressed by the Reactor Vessel Internals Program). The applicant will develop the NiCrFe Component Assessment Program to ensure that the component functions will be maintained during the period of extended operation.

In light of the previous discussion with respect to 82/182 welds, the staff believes that the applicant's commitment should reflect that the lessons learned from industry initiatives and research will become part of the NiCrFe Component Assessment Program. Because the program has not been developed, the applicant has not demonstrated that it will identify and assist in managing the effects of age-related degradation mechanisms.

Therefore, in RAI B.5.8-1, the staff requested the following actions of the applicant:

> Please modify commitment A2.18 to assure that interim report "PWR Materials Reliability Project Interim Alloy 600 Safety Assessment for US PWR Plants (MRP-44), Part 1: Alloy 82/182 Pipe Butt Welds," and its final version will be used as part of the basis for the NCAP. The commitment should state that the NCAP will be submitted with sufficient time for staff review and approval to determine if the program demonstrates the ability to manage the effects of aging per 10 CFR 50.54.21(a)(3).

In its response to RAI B.5.8-1, dated June 10, 2004 (SNC Letter No. NL-04-0967), the applicant stated that it will revise Appendix A.2.18, "NiCrFe Component Assessment Program," to the

FNP FSAR Supplement to add that FNP will continue to participate in industry initiatives (such as the WOG and the EPRI MRP). Susceptibility rankings and program inspection requirements will ensure that the applicant is consistent with the later version of the EPRI MRP's safety assessment regarding Alloy 82/182 pipe butt welds or its successors. The applicant also committed to submit an inspection plan for the NiCrFe Component Assessment Program for NRC review and approval at least 24 months before entering the period of extended operation for the FNP units. To obtain NRC staff's approval of its inspection plan for the NiCrFe Component Assessment Program prior to the period of extended operation for the FNP units, the applicant must submit a license amendment request. After the NRC staff's approval of the inspection plan for the NiCrFe Component Assessment Program, any future changes to the inspection plan will be evaluated in accordance with the 10 CFR 50.59 process. The staff concludes that the implementation of the commitments made in response to RAI B.5.8-1 will ensure that the appropriate program changes will be implemented (i.e., those that assure the structural integrity of the reactor vessel heads and other nickel-based alloys in the primary coolant system during the period of extended operation). Therefore, the staff considers RAI B.5.8-1 closed.

[Program Scope] The applicant stated that the scope of the NiCrFe Component Assessment Program includes nickel-based alloy RCPB components with known or potential susceptibility to PWSCC, excluding SG tubes, which are addressed by the Steam Generator Program, and reactor internals which are addressed by the Reactor Vessel Internals Program. The action required of these BL's is addressed in the Borated Water Leakage and Assessment Program.

[Preventive Actions] The applicant stated that the NiCrFe Component Assessment Program does not contain any direct preventive or mitigating attributes and that the Water Chemistry Control Program provides prevention attributes. The applicant stated that material replacement was also an available option to prevent or mitigate the potential for PWSCC. The Preventive Actions program attribute did not clearly indicate what actions or what replacement materials the applicant would use to demonstrate acceptable management of age-related degradation mechanisms.

[Parameters Inspected or Monitored] The applicant stated that the NiCrFe Component Assessment Program will not directly inspect or monitor cracking within NiCrFe alloy components and that the program assessment will utilize the most current industry susceptibility models to develop a set of plant-specific inspection requirements to address potential PWSCC in FNP NiCrFe components. Because the NiCrFe Component Assessment Program is a plant-specific program that ranks components susceptible to PWSCC, rather than a condition monitoring or performance program, as defined by BTP RLSB-1, the applicant must demonstrate that the ranking of the components for susceptibility to PWSCC is appropriate and consistent with industry experience and regulatory requirements.

[Detection of Aging Effects] The applicant stated that this assessment program will not directly detect or size PWSCC cracks within the NiCrFe Component Assessment Program components, but it will be used to recommend augmented inspection locations, schedules, and techniques based upon the capability of detecting tight PWSCC-type cracks before any loss of component intended function. These techniques may include visual, surface, or volumetric methods.

The staff expects that aging effects can be detected before there is a loss of intended function. This expectation is based on operating experience to date and a combination of engineering evaluations to predict PWSCC, periodic visual inspection, and nondestructive testing to validate predictions. This program element describes the “when, where, and how” aspects of program data collection. The applicant stated that the intent of this element was to detect the effects of aging before loss of component intended function, but did not provide the justification to support the program’s ability to accomplish this.

[Monitoring and Trending] The applicant stated that it will perform the cracking susceptibility assessment, subsequent identification of enhanced inspection requirements, and any initial inspections for both Units 1 and 2 before entering the period of extended operation. The applicant stated that it will integrate program inspections with the FNP Inservice Inspection Program inspections and that it will track inspection results within the FNP ISI plan.

The staff finds that this program element does not provide adequate detail to assure that the effects of PWSCC are managed. For instance, the element does not discuss how the applicant will evaluate the data/results against the acceptance criteria and how it will make a prediction regarding the rate of degradation. This prediction is made to confirm that the timing of the next scheduled inspection will occur before a loss of the system/component intended function.

[Acceptance Criteria] The applicant stated that the acceptance criteria for any flaws identified will be based upon ASME Section XI requirements or other acceptable fracture mechanic methods. If the flaw is to remain in service, the acceptance evaluation will consider component stresses, updated crack growth rate models, and material toughness.

At a minimum, the applicant is required by 10 CFR 50.55a to comply with the flaw acceptance criteria specified for ASME Class 1 components in the ASME Code, Section XI, Articles IWA-3000 and IWB-3000, regardless of whether the material is fabricated from Alloy 600. The applicant may use alternative acceptance criteria either from the applicant or the industry, if the alternative criteria have been submitted to and accepted by the staff pursuant to 10 CFR 50.55a(a)(3). The acceptance criteria stated were not definitive enough to determine if the applicant would allow pressure boundary leakage, if the fracture mechanics analysis determined that the component could perform its intended function.

By RAI B.5.8-1, the staff requested the following actions of the applicant:

> Under Appendix A2.18 of the LRA, the applicant stated that it will implement the new NiCrFe Component Assessment Program (NCAP) prior to the period of extended operation. In its commitment, the applicant stated that the NiCrFe Component Assessment Program will be developed to address industry concerns regarding the potential for primary water stress corrosion cracking (PWSCC) in nickel alloy components exposed to the reactor coolant environment.
>
> The applicant’s commitment needs to reflect that the lessons learned from industry initiatives and research will become part of the NCAP. The applicant is requested to modify commitment A2.18 to state that the NCAP will be submitted with sufficient time prior to the period of extended operation in order for staff review and approval to determine if the program demonstrates the ability to manage the effects of aging in Alloy 600 components per 10 CFR 50.54.21(a)(3). Also add a commitment that interim report "PWR Materials Reliability Project Interim Alloy 600 Safety Assessment for US PWR Plants (MRP-44), Part 1: Alloy 82/182 Pipe Butt Welds," and/or its final version, will be

used as part of the basis for the NCAP when the ranking of components' susceptibility to PWSCC is performed.

The applicant's response dated April 29, 2004 (SNC Letter No. NL-04-0715), and its supplemental response, dated June 10, 2004 (SNC Letter No. NL-04-0967), to RAI B.5.8-1, stated that the FNP FSAR Supplement Appendix A.2.18, NiCrFe Component Assessment Program, will be revised to reflect its continued participation in industry initiatives. Through its involvement, it will update program susceptibility rankings and inspection requirements, and that the NiCrFe Component Assessment Program will be submitted at least 24 months prior to the period of extended operation for NRC review. During discussions with the staff, the applicant and staff agreed that the program elements would be resolved when the NiCrFe Component Assessment Program is finalized and submitted for staff review and approval. Based on the applicant's responses and its commitment to submit the program for staff review prior to the period of extended operation, the staff considers RAI B.5.8-1 closed.

[Operating Experience] The applicant indicated that currently no evidence of PWSCC exists in its nickel-based alloys to date (in particular, Alloy 600 materials with 82/182 welds). The applicant stated that it was in the process of procuring replacement RPV heads and will replace them before entering the period of extended operation. The material used for the replacement will utilize thermally treated Alloy 690 base metal, with Alloy 52/152 weld metal for all head penetrations. The staff considers the use of Alloy 690 base metal with Alloy 52/152 weld metal for the penetrations to be a generally accepted method of material substitution resulting from PWSCC-related cracking. This demonstrates where an existing program (element) has succeeded because it used objective evidence based on operating experience to intercept the effects of an age-related degradation mechanism in a timely manner; therefore, it is acceptable to the staff.

<u>FSAR Supplement</u>

In its responses to RAI B.5.8-1, dated April 29, 2004 (SNC Letter No. NL-04-0715) and June 10, 2004 (SNC Letter No. NL-04-0967), the applicant stated that it will revise Appendix A.2.18 to the FNP FSAR Supplement. In its letter dated April 29, 2004, the applicant stated the following:

> FNP FSAR Supplement Appendix A.2.18, NiCrFe Component Assessment Program, will be revised to add the following text:
>
> FNP will continue to participate in industry initiatives (such as the Westinghouse Owners Group and the EPRI Materials Reliability Program). Susceptibility rankings and program inspection requirements will be consistent with the latest version of the EPRI Materials Reliability Program safety assessment regarding Alloy 82/182 pipe butt welds or its successors.
>
> SNC will submit an inspection plan for the NiCrFe Component Assessment Program for NRC review and approval at least 24 months prior to entering the periods of extended operation for the FNP units.

In its supplemental response to RAI B.5.8-1, dated June 10, 2004 (SNC Letter No. NL-04-0967), the applicant clarified that it will revise the FNP License Renewal Future Action Commitment List accordingly. By letter dated July 27, 2004 (SNC Letter No. NL-04-1267), the applicant included the above statements regarding its NiCrFe Component Assessment Programs in its FNP-License Renewal Future Action Commitments, as stated.

Based on the above, the staff found that the FSAR Supplement summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d), and is therefore acceptable.

Conclusion

The staff has reviewed the information provided in Section B.5.8 of Appendix B to the LRA, as supplemented by the applicant's supplemental responses to RAI B.5.8-1 dated April 29, 2004 (SNC Letter No. NL-04-0715) and June 10, 2004 (SNC Letter No. NL-04-0967). On the basis of this review, the applicant has demonstrated that it will have a program in place, reviewed and approved by the staff, which demonstrates that the effects of aging associated with NiCrFe Class 1 components 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 reviewed the associated FSAR Supplement for this AMP and concludes that the FSAR Supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.4 Periodic Surveillance and Preventive Maintenance Activities Program

Summary of Technical Information in the Application

The applicant described its Periodic Surveillance and Preventive Maintenance Activities in Section B.5.9 of a letter dated June 18, 2004 (SNC Letter No. NL-04-1038). The Periodic Surveillance and Preventive Maintenance Activities is a new, non-GALL program that was not in the original LRA. The program provides for periodic inspections and testing of the internal elastomer diaphragms for the boric acid tanks, reactor makeup water storage tanks, and condensate storage tanks (CST) for evidence of defects and age-related degradation, such as changes in material properties, cracking, and loss of material. By letter dated August 31, 2004 (SNC Letter No. NL-04-1594), the applicant added periodic inspections of the charging/high head safety injection (HHSI) pump casings for loss material (base metal corrosion due to clad cracking) to the Periodic Surveillance and Preventive Maintenance Activities (PSPMA). Inspection intervals are dependent on the component material and environment and take into consideration industry and plant-specific operating experience and manufacturer recommendations. No operating experience is specifically applicable to the Periodic Surveillance and Preventive Maintenance Activities. This program is implemented through repetitive tasks and surveillances. The Periodic Surveillance and Preventive Maintenance Activities credited for license renewal will be implemented before the period of extended operation.

Staff Evaluation

In Section B.5.9 of its letter dated June 18, 2004 (SNC Letter No. NL-04-1038), the applicant described its Periodic Surveillance and Preventive Maintenance Activities Program to manage aging of the elastomer diaphragms for the boric acid tanks, reactor makeup water storage tanks, and CSTs. By letters dated August 31, 2004 (SNC Letter No. NL-04-1594) and September 15, 2004 (SNC Letter No. NL-04-1801 and response to RAI 3.2-8), the applicant described its PSPMA to manage aging for the charging/HHSI pump casings. The Periodic Surveillance and Preventive Maintenance Activities Program is not based on a GALL Report program; therefore, the staff reviewed the program using the guidance in BTP RLSB-1 in Appendix A to the SRP-LR. The staff's evaluation focused on managing aging effects through incorporation of the following 10 elements from RLSB-1—program scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, corrective actions, confirmation process, administrative controls, and operating experience. The applicant indicated that the corrective actions, confirmation process, and administrative controls for license renewal are in accordance with the site-controlled Quality Assurance Program. Section 3.0.4 of this SER provides a separate discussion of the staff's evaluation of the applicant's Quality Assurance Program, and the evaluation of the remaining seven elements is provided below. The staff also reviewed the FSAR Supplement to determine whether it provides an adequate description of the program.

[Program Scope] The Periodic Surveillance and Preventive Maintenance Activities include those preventive maintenance and surveillance testing activities credited with managing the aging effects identified in the AMRs. The components include the internal diaphragms for the boric acid tanks, reactor makeup water storage tanks, CST, and charging/HHSI pump casings. The staff finds that the applicant's description of the scope adequately includes the components which credit this program; therefore, the staff finds the scope acceptable.

[Preventive Actions] The applicant identified the Periodic Surveillance and Preventive Maintenance Activities as a condition monitoring program. The inspection and testing activities performed by this program do not prevent aging effects. This assessment is in accordance with the GALL Report which states that condition monitoring programs do not rely on preventive action and thus, preventive actions need not be addressed in condition monitoring programs. The staff agrees with the applicant's assessment and does not identify the need for preventive actions; therefore, the staff finds this acceptable.

[Parameters Monitored or Inspected] The applicant stated in the Periodic Surveillance and Preventive Maintenance Activities that for each inspection or test activity, instructions on the parameters inspected or monitored are provided to permit early detection of degradation before loss of component intended function. The parameters inspected or monitored are dependent on the components and aging effects being managed. Inspection and testing activities monitor various parameters, such as surface condition, loss of material, presence of corrosion products or fluid leakage, signs of cracking, wall thickness, pressure, temperature, and flow.

Surface condition and loss of material inspections of the tank diaphragm are methods to detect degradation; however, it is not apparent to the staff how inspections for the presence of corrosion products or fluid leakage, wall thickness, pressure, temperature, or flow will detect the presence and extent of aging effects for the internal elastomer tank diaphragms. In RAI B.5.9-1.a, the staff requested the applicant to explain how it will use inspections for the presence of corrosion products or fluid leakage, wall thickness, pressure, temperature, and flow to detect the presence and extent of aging effects for the internal elastomer tank diaphragms. By letter dated July 16, 2004 (SNC Letter No. NL-04-1296), the applicant stated that the parameters listed are common parameters which can provide information on the condition of various types of components. The parameters inspected or monitored are dependent on the components and the aging effects being managed. This paragraph does not indicate which parameters will be monitored for the tank diaphragms. For each component included in the Periodic Surveillance and Preventive Maintenance Activities program, an implementing activity will be created which inspects or monitors the parameters which provide the most reliable indication of age-related degradation. In the case of the tank diaphragms, the applicant will perform visual inspections. These inspections will include inspection of the diaphragm flotation devices, checking for water on top of the diaphragm (fluid leakage), and visual inspection of diaphragm material for degradation (cracking, chalking, tears, etc.) where appropriate. Based on its review, the staff finds the applicant's response to RAI B.5.9-1.a acceptable because it describes the specific types of visual inspections that the applicant will perform to detect degradation of the tank diaphragms.

As identified by NRC Information Notices (IN) 80-38 and 94-63, FNP's six charging/HHSI pump casings are susceptible to loss of material due to clad cracking and subsequent corrosion in the carbon steel base metal. Inspections include visual examinations of the internal surfaces of the casings (with the rotating assemblies removed) and periodic non-intrusive UT exams of accessible areas of the pump casings to detect through-clad cavities (loss of material) in the carbon steel base material.

The parameters monitored or inspected element adequately describes the methods to monitor or inspect the components credited by this activity; therefore, the staff finds it to be acceptable.

[Detection of Aging Effects] The applicant stated that the Periodic Surveillance and Preventive Maintenance Activities provides for periodic component inspections and testing to detect aging effects. Intervals are established such that they provide for timely detection of degradation. Inspection intervals are dependent on the component material and environment and take into consideration industry and plant-specific operating experience and manufacturer recommendations. The extent and schedule of inspections and testing assure detection of component degradation before loss of intended functions. The applicant uses established techniques such as visual inspections.

For the detection of aging effects, the GALL Report recommends that the program provide justification linked to plant-specific or industry operating experience that the periodic inspection frequencies are adequate to detect the aging effects before a loss of intended function occurs. The applicant stated that the Periodic Surveillance and Preventive Maintenance Activities establish intervals to provide for timely detection of degradation of the elastomer tank diaphragms. In RAI B.5.9-1, the staff requested the applicant to provide an inspection frequency of the tank diaphragms that would detect the aging effects prior to loss of intended function. By letters dated July 16, 2004, and August 5, 2004, the applicant stated that aging management of the Condensate Storage, Reactor Make-up Water Storage, and the Boric Acid tank diaphragms per the Periodic Surveillance and Preventive Maintenance Activities program will be implemented prior to the period of extended operation via an inspection of a sample set of diaphragms. The diaphragm(s) selected for this sample will be based on the age of each diaphragm (years in operation), the severity of the diaphragm environment, and the operating conditions (frequency and degree of the cycling of the tank's level). The initial inspections for the sample set will be performed prior to the period of extended operation. The periodic inspection for the diaphragm sample set will initially be established on a ten (10) year frequency. Scheduling will be performed in accordance with existing site procedures. This frequency of inspection is subject to modification based on considerations such as observed degradation and operating experience. Staff notes that vendor has indicated that inspections of diaphragms similar to those installed at FNP after ten years of operation show no significant aging of the diaphragm material. Based on its review, the staff finds the applicant's response to RAI B.5.9-1 acceptable because they adequately describe the detection of aging effects and inspection frequency for the tank diaphragms; therefore, staff finds the detection of aging effects element acceptable.

In its supplemental information to the LRA, by letter dated August 31, 2004 (SNC Letter No. NL-04-1594), the applicant stated that the charging/HHSI pump casing inspections are existing periodic tasks that manage loss of material in the carbon steel base metal resulting from boric acid corrosion at locations of clad cracking. Inspections include periodic non-intrusive exams of accessible areas of the pump casings to detect through-clad cavities (loss of material) in the carbon steel base material. In 1996, the rotating assembly of the 2A charging/HHSI pump was removed for a pump maintenance activity. FNP visually discovered a brownish-red residue at two locations in the suction end of the casing indicative of carbon steel base metal corrosion from through-clad cracks. VT-1, VT-3, and radiography were performed, and a corrosion wastage assessment was performed by the NSSS vendor (Westinghouse). The 2A pump was placed on an increased frequency of inspection, with UT of the pump casing performed every six months during the next three plant operating cycles to quantify the rate of material loss. The results of these inspections indicated no apparent changes from the previous inspection results. A visual exam was also performed after the third cycle of operation (March 2001). The results of these inspections confirmed the corrosion of the carbon steel base metal is progressing at a very slow rate. Visual examinations have been performed on charging/HHSI pump casings 1A, 1C, 2A, and 2C, and are scheduled for 1B and 2B in 2004 and 2005, respectively. Indications of base metal corrosion due to cladding cracks have only been found in the 2A pump casing. The applicant further indicated that VT-1 visual inspections will be performed any time a rotating assembly is removed during pump maintenance. UT examination is performed over all accessible areas of the pump casings on an 18-month frequency for the 2A pump, and on a 36-month frequency for pumps 1A, 1B, 1C, 2B, and 2C.

The detection of aging effects element adequately describes methods to detect degradation for the components credited by this activity; therefore, the staff finds it to be acceptable.

[Monitoring and Trending] The applicant stated that the Periodic Surveillance and Preventive Maintenance Activities provide monitoring and trending of age-related degradation. Inspection and testing intervals are established such that they result in timely detection of component degradation. Inspection and testing intervals are dependent on the component material and environment and take into consideration industry and plant-specific operating experience and manufacturer recommendations. The frequency of inspection or other activities is subject to modification based on plant-specific environment or observed degradation. Such observations may dictate that an increased or decreased task frequency would be prudent for a particular activity.

For monitoring and trending, the GALL Report recommends that the Periodic Surveillance and Preventive Maintenance Activities program provide predictability of the extent of degradation and timely corrective actions. In RAI B.5.9-1c, the staff requested the applicant to explain how the data collected are evaluated against the acceptance criteria to provide a prediction of the rate of degradation in order to confirm that the timing of the next scheduled inspection will occur before a loss of intended function. By letter dated July 16, 2004 (SNC Letter No. NL-04-1296), the applicant stated that the acceptance criteria for the tank diaphragm inspection activities are focused on maintaining required integrity. The inspection data and acceptance criteria are not used to “provide a prediction of the rate of degradation,” but rather to identify observable degradation in regards to maintaining required integrity. The inspection parameters and criteria are focused on detecting degradation that may challenge the integrity of the tank diaphragms and initiating appropriate corrective action. Inspection of the flotation devices is intended to confirm that the devices are operating properly and are fully attached with no evidence of degradation that could impair the function of the flotation devices. Water on top of the diaphragm is a potential indicator of cracking, perforation, or tearing of the diaphragm. Visible cracking, chalking, tears, etc. are recognized indicators of progressive aging in elastomer materials. The applicant will investigate conditions that do not meet the acceptance criteria and initiate corrective action under the existing condition reporting system. Based on its review, the staff finds the applicant's response to RAI B.5.9-1.c acceptable because it adequately describes monitoring of the tank diaphragms; the staff does not identify the need for trending in this AMP.

In its supplemental information to the LRA, by letter dated August 31, 2004 (SNC Letter No. NL-04-1594), the applicant stated that UT examination of the charging/HHSI pump casing is currently performed on an 18-month frequency for the 2A pump, and on a 36-month frequency for pumps 1A, 1B, 1C, 2B, and 2C. Visual inspections will be performed any time a rotating assembly is removed during pump maintenance. Any indications or relevant conditions of degradation are evaluated, including relative changes to any previously identified indications. The frequency of inspection is subject to modification based on the observed degradation and any trend from prior inspections.

The monitoring and trending element adequately describes methods to monitoring and trending the components credited by this activity; therefore, the staff finds it to be acceptable.

[Acceptance Criteria] The applicant stated that the Periodic Surveillance and Preventive Maintenance Activities acceptance criteria will be defined in specific inspection and testing procedures. The acceptance criteria confirm component integrity by verifying the absence of aging effects or by comparing applicable parameters to limits based on applicable intended functions established by the plant’s design basis. The applicant will include acceptance criteria that directly correlate to the AERMs applicable to the activity. The acceptance criteria for signs of degradation, such as cracking, perforation, tearing, and chalking of the diaphragms, will be based on codes, standards, specifications, vendor recommendations, industry guidance, engineering judgment and/or site operating experience as applicable. Degradations deemed to be unacceptable will have a condition report initiated and resolution will be handled under the Corrective Action Program.

In its response to RAI 3.2-8, by letter dated September 15, 2004 (SNC Letter No. NL-04-1801), the applicant stated that the objective of the charging/HHSI pump casing UT examination procedure is to detect loss of material in the carbon steel (e.g. cavities in the carbon steel) base metal that may result from a clad crack with resultant exposure to borated water. Examination techniques include straight beam (0 degree) and angle beam (45 degrees) examinations. Any indications or relevant conditions of degradation detected are evaluated. The specific pump drawings are reviewed, and any indications not representative of the pump casing geometrical design are reported. Relative changes in any previously identified indications are also reported. Reported conditions are then evaluated under the corrective actions program. VT-1 visual inspections will be performed any time a rotating assembly is removed during pump maintenance.

The staff finds that the applicant's acceptance criteria based on codes, standards, specifications, vendor recommendations, industry guidance, engineering judgment and/or site operating experience are adequate to confirm component integrity; therefore, the staff finds the acceptance criteria acceptable.

[Operating Experience] The applicant stated that no operating experience exists for the new Periodic Surveillance and Preventive Maintenance Activities program; however, FNP's history of successful operation demonstrates that existing preventive maintenance and surveillance testing activities have been effective at managing the effects of aging, including identifying and correcting degraded conditions.

The GALL Report recommends that the operating experience provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the intended function will be maintained. In RAI B.5.9-1.d, the staff requested the applicant to provide plant-specific and industry operating experience for degradation of internal elastomer tank diaphragms to support the conclusion that the diaphragms will be adequately managed by the Periodic Surveillance and Preventive Maintenance Activities, or commit to providing operating experience in the future to confirm the effectiveness of this new program. By letter dated July 16, 2004 (SNC Letter No. NL-04-1296), the applicant stated that the boric acid tank diaphragms are made from a polyvinyl chloride (PVC) material. The CST and the reactor makeup water storage tank diaphragms were originally made from rubber and were replaced in the 1990s with thermoplastic elastomer materials. There have been no indications of degradation or failure of the currently installed diaphragms at FNP. The vendor has indicated that inspections of diaphragms similar to those installed at FNP show no significant aging of the diaphragm material after 10 years of operation. FNP and industry operating history demonstrates age-related degradation of elastomer tank diaphragms progresses slowly in the nonaggressive environments internal to the tanks. Periodic visual inspections have proven effective at detecting age-related degradations of elastomers before loss of function and have previously been found acceptable by the NRC staff. Based on the slow progression of age-related degradation and the effectiveness of periodic visual inspections, SNC concludes that the Periodic Surveillance and Preventive Maintenance Activities program will adequately manage aging of the tank diaphragms. Based on its review of the applicant's response to RAI B.5.9-1.c, the staff finds that the operating experience supports the conclusion that the Periodic Surveillance and Preventive Maintenance Activities Program will be effective in preventing aging of the tank diaphragms; therefore, the staff finds it acceptable.

The staff’s RAI 3.2-8, dated September 14, 2004, requested the applicant to provide plant-specific and industry operating experience for degradation of the charging/HHSI pump casings to support the conclusion that the pump casings will be adequately managed by the PSPMA. By letter dated September 15, 2004 (SNC Letter No. NL-04-1801), the applicant responded by stating that periodic non-intrusive UT examinations and internal surface visual examinations with the rotating assembly removed during pump maintenance have proven successful at FNP in detecting and managing this aging effect with no loss of intended function. Visual examination of the internal surface of the pump casing (with the rotating assembly removed) has successfully identified corrosion of the base metal due to cladding cracks. In the 2A charging/HHSI pump, an internal surface visual examination readily detected indications of base metal corrosion due to cladding cracks. UT examination has been shown to be a reliable technique for monitoring wall thickness (loss of material) in components. Non-intrusive UT examination has successfully monitored the FNP charging pump casings for indications of loss of material in the base metal. For the 2A charging/HHSI pump indications, the periodic UT examinations have confirmed that actual material loss is progressing at a very slow rate. The frequency of inspection assures that the was thickness will not exceed ASME code requirements. There has been no loss of intended functions in any charging/HHSI pump as a result of this aging effect. The operating experience demonstrates that program activities are adequate to detect and manage loss of material in the charging/HHSI pump casings due to clad cracking, such that the component intended function will be maintained during the period of extended operation. Based on its review of the applicant's response to RAI 3.2-8, the staff finds that the operating experience supports the conclusion that the PSPMA program is effective at preventing aging of the charging/HHSI pump casings; therefore, the staff finds it to be acceptable.

FSAR Supplement

By letter dated June 18, 2004 (SNC Letter No. NL-04-1038), the applicant provided its FSAR Supplement for the Periodic Surveillance and Preventive Maintenance Activities Program for Appendix A, Section A.2.20, of the LRA. The staff reviewed the FSAR Supplement and finds that the summary description contains a sufficient level of information to satisfy 10 CFR 54.21(d) and is therefore acceptable.

Conclusion

On the basis of its review of the applicant's program the staff finds that the program adequately addresses the 10 program elements defined in BTP RLSB-1 in Appendix A.1 to the SRP-LR, and that the program will adequately manage the aging effects for which it is credited. The staff also reviewed the FSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, on the basis of its review, the staff concludes that the applicant has demonstrated that the effects of aging associated with the SCs that credit the Periodic Surveillance and Preventive Maintenance Activities Program 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).

3.0.3.3.5 Conclusion

On the basis of its review of the applicant's AMPs, the staff concludes that for the AMPs listed above, 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 reviewed the associated FSAR Supplements for these AMPs and concludes that the FSAR Supplements provide an adequate summary description of the programs, as required by 10 CFR 54.21(d).

3.0.4 Quality Assurance Program Attributes Integral to Aging Management Programs

Pursuant to 10 CFR 54.21(a)(3), a license renewal applicant is required to demonstrate that the effects of aging on structures and components subject to an Aging Management Review (AMR) will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation. NUREG-1800, SRP-LR, Branch Technical Position RLSB-1, "Aging Management Review - Generic," describes ten attributes of an acceptable aging management program. Three of these ten attributes are associated with the quality assurance activities of corrective action, confirmation processes, 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:

- corrective actions, including root cause determination and prevention of recurrence, should be timely;

- the confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective; and,

- administrative controls should provide a formal review and approval process.

NUREG-1800, Branch Technical Position IQMB-1, “Quality Assurance For Aging Management Programs,” noted that those aspects of the aging management program that affect quality of safety-related structures, systems, and components are subject to the quality assurance (QA) requirements of 10 CFR Part 50 Appendix B. Additionally, for non safety-related-related structures and components subject to an aging management review, the existing 10 CFR Part 50 Appendix B QA program may be used by the applicant to address the elements of corrective actions, the confirmation process, and administrative controls. Branch Technical Position IQMB-1 provides the following guidance with regard to the quality assurance attributes of aging management programs:

- Safety-related structures and components are subject to 10 CFR Part 50 Appendix B requirements, which are adequate to address all quality-related aspects of an aging management program consistent with the CLB of the facility for the period of extended operation.

- For non safety-related-related structures and components that are subject to an AMR for license renewal, an applicant has an option to expand the scope of its 10 CFR Part 50 Appendix B program to include these structures and components to address corrective actions, the confirmation process, and administrative controls for aging management during the period of extended operation. In this case, the applicant should document such a commitment in the FSAR supplement in accordance with 10 CFR 54.21(d).

3.0.4.1 Summary of Technical Information in Application

Section 3.0, "Aging Management Review Results," of the LRA provides an AMR summary for each unique structure, component, or commodity group at the FNP determined to require aging management during the period of extended operation. This summary includes identification of aging effects requiring management and AMPs utilized to manage these aging effects. Appendix B, “Aging Management Programs and Activities,” of the LRA demonstrates how the identified programs manage aging effects using attributes consistent with the industry and NRC guidance. The applicant’s programs and activities that are credited with managing the effects of aging can be divided into three types of programs: (1) existing aging management programs, (2) enhanced aging management programs, and (3) new aging management programs.

In Section B.1.4, “Aging Management Program Quality Control Attributes,” of the LRA, the applicant provided the following generic description of the quality attributes common to all the plant specific aging management programs:

[Corrective Actions] FNP applies a single corrective actions process, regardless of the safety classification of the system, structure or component. Corrective actions are initiated in accordance with plant procedures established to implement 10 CFR 50, Appendix B.

FNP requires documentation of actual or potential problems including, but not limited to, unexpected plant equipment degradation, damage, failure, or malfunction. FNP will include in site implementing procedures for programs credited for aging management a statement requiring corrective action be initiated whenever appropriate criteria are not met.

[Confirmation Process] The focus of the FNP confirmation process is formal follow-up actions that must be taken to verify effective implementation of corrective actions. Effectiveness is measured in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality.

Plant procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause determinations and prevention of recurrence where appropriate (e.g., significant conditions adverse to quality). These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure effective corrective actions have been implemented. The corrective actions process is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of corrective actions.

[Administrative Controls] FNP administrative controls require formal written procedures and other forms of administrative controls for the activities performed under the programs credited for managing aging during the renewal term. These FNP procedures contain or will contain objectives, program scope, responsibilities, methods for implementation, and acceptance criteria.

3.0.4.2 Staff Evaluation

The NRC staff reviewed the applicant's aging management programs described in Appendix A, "Final Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs and Activities," of the FNP license renewal application. The purpose of this review was to assure that the aging management activities were consistent with the staff's guidance described in NUREG-1800, Section A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)," regarding quality assurance attributes of aging management programs. Based on the staff's evaluation, the descriptions and applicability of the plant-specific aging management programs and their associated quality attributes provided in Appendix A and Appendix B of the LRA are consistent with the staff's position regarding quality assurance for aging management. However, the applicant did not sufficiently described the use of the quality assurance program and its associated attributes (corrective action, confirmation process, and administrative controls) in the discussions provided for aging management programs described in Appendix A. By letter dated December 12, 2003, the staff requested that the applicant supplement the descriptions in the Appendix A, "Final Safety Analysis Report Supplement," to include a description of the quality assurance program attributes, including references to pertinent implementing guidance as necessary, which are credited for the programs described in Appendix B of the LRA. This was RAI 2.1-2.

In its January 9, 2004, response to RAI 2.1-2, the applicant stated that the FSAR Supplement (Appendix A) will be updated to include information regarding the applicability of the FNP Quality Assurance Program to aging management programs credited to manage the aging effects for in-scope SSCs. Specifically, the applicant stated that the FNP Operations Quality

Assurance Program will apply the quality assurance criteria of 10 CFR 50, Appendix B to the elements of corrective action, confirmation process, and administrative controls for the aging management program activities and implementing documents during the period of extended operation.

On February 5, 2004, the staff held a conference call with the applicant to get further clarification on the RAI response. Specifically, the staff requested the applicant update the FSAR Supplement to clarify that in addition to imposing the 10 CFR 50, Appendix B criteria on the three (3) quality assurance attributes for all AMPs, that the AMPs would apply to all plant systems, structures and components within the scope of license renewal and subject to those AMPs. The applicant agreed to make such a revision to the FSAR description and provided a revised description by letter dated March 31, 2004. In its letter dated March 31, 2004, the applicant stated that the quality assurance criteria of corrective actions, confirmation process, and administrative controls will apply to all safety-related and non safety-related structures and components that perform an intended function for license renewal. Based on this revised description, the staff concludes that the applicant will apply the corrective action program, as described in LRA to all plant systems, structures and components (both safety-related and non-safety-related) within the scope of license renewal and subject to the AMPs described in Appendix B of the LRA. Therefore, RAI 2.1-2 is closed.

3.0.4.3 Conclusion

On the basis of the information provided in the LRA, as supplemented by the applicant's response to the staff's request for additional information, the applicant's quality assurance description for its AMPs is acceptable. Specifically, the applicant described the quality attributes of the programs and activities for managing the effects of aging for both safety-related and non-safety-related SSCs within the scope of license renewal and stated that the 10 CFR Part 50 Appendix B Quality Assurance Program provides corrective actions, confirmation processes, and administrative controls. The staff finds that the quality assurance attributes 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 RCS components and component groups associated with the following systems:

- reactor vessel
- reactor vessel internals
- reactor coolant system and connected lines
- steam generators

3.1.1 Summary of Technical Information in the Application

In LRA Section 3.1, the applicant provided AMR results for the reactor vessel, internals, and RCS components and component groups. Tables 2.3.1.1, 2.3.1.2, 2.3.1.3, and 2.3.1.4 of the LRA identify the passive, long-lived reactor vessel, reactor internals and reactor coolant system components that are subject to an AMR.

In Table 3.1.1, "Summary of Aging Management Evaluations for Reactor Vessel, Internals, and Reactor Coolant System in Chapter IV of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the reactor vessel, internals, and RCS components and component groups that are relied on for license renewal. In Section 3.1.2.2 of the LRA, the applicant provided information concerning Table 3.1.1 components for which the GALL Report recommends further evaluation.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report in 2001.

The applicant conducts ongoing review of plant-specific and industry operating experience in accordance with the plant Operating Experience Program.

3.1.2 Staff Evaluation

The staff reviewed Section 3.1 of the LRA to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the reactor system components that are within the scope of license renewal and subject to an AMR 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 performed an audit and review to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report. However, the staff did determine that the applicant presented applicable material in the LRA and identified the appropriate GALL AMPs. Section 3.0.3 of this SER documents the staff's evaluations of the AMPs. The FNP Audit and Review Report, summarized in Section 3.1.2.1 of this SER, documents the details of the staff's evaluation of the audit and review for these AMRs.

The staff also performed an audit and review of those AMRs that were consistent with the GALL Report and for which further evaluation is recommended. During the audit and review, the staff determined that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.1.2.2 of the SRP-LR. The FNP Audit and Review Report, summarized in Section 3.1.2.2 of this SER, documents the details of the staff's evaluation of the audit and review for these AMRs.

The staff conducted a technical review of the remaining AMRs that were not consistent with the GALL Report. The staff evaluated whether the applicant identified all plausible aging effects and listed the appropriate aging effects for the material-environment combinations specified. Section 3.1.2.3 of this SER documents the details of the staff's review and evaluation of these AMRs that are not consistent with the GALL Report.

Finally, the staff reviewed the AMP summary descriptions in the Final Safety Analysis Report (FSAR) Supplement to ensure that they adequately describe the programs credited with managing or monitoring aging for the reactor system components.

Table 3.1-1 summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in Section 3.1 of the LRA that are addressed in the GALL Report.

Table 3.1-1 Staff Evaluation for Reactor Vessel, Internals, and Reactor Coolant System Components in the GALL Report

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Reactor coolant pressure boundary (RCPB) components **Item Number 3.1.1-1**	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.1)
Steam Generator shell assembly **Item Number 3.1.1-2**	Loss of material due to pitting and crevice corrosion	Inservice inspection; water chemistry	Water Chemistry Control Program (Appendix B.3.2); Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.2)
Pressure vessel ferritic materials that have a neutron fluence greater than 10^{17}n/cm^2 (E>1 MeV) **Item Number 3.1.1-4**	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G to 10 CFR Part 50 and RG 1.99	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.3)
Reactor vessel beltline shell and welds **Item Number 3.1.1-5**	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor vessel surveillance	Reactor Vessel Surveillance Program (Appendix B.3.4)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.3)
Westinghouse and Babcock & Wilcox baffle/former bolts **Item Number 3.1.1-6**	Loss of fracture toughness due to neutron irradiation embrittlement and void swelling	Plant specific	Reactor Vessel Internals Program (Appendix B.5.1)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.3)
Small-bore Reactor Coolant System and connected systems piping **Item Number 3.1.1-7**	Crack initiation and growth due to stress corrosion cracking (SCC), intergranular stress corrosion cracking (IGSCC), and thermal and mechanical loading	Inservice inspection; water chemistry; one-time inspection	Inservice Inspection {Program (Appendix B.3.1); Water Chemistry Control Program (Appendix B.3.2); One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.4)
Vessel shell **Item Number 3.1.1-10**	Crack growth due to cyclic loading	TLAA	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.5)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Reactor internals **Item Number 3.1.1-11**	Changes in dimension due to void swelling	Plant specific	Reactor Vessel Internals Program (Appendix B.5.1)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.6)
PWR core support pads, instrument tubes (bottom head penetrations), pressurizer spray heads, and nozzles for the steam generator instruments and drains **Item Number 3.1.1-12**	Crack initiation and growth due to SCC and/or primary water stress corrosion cracking (PWSCC)	Plant specific	Water Chemistry Control Program (Appendix B.3.2); NiCrFe Component Assessment Program (Appendix B.5.8)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.7)
Cast austenitic stainless steel (CASS) RCS piping **Item Number 3.1.1-13**	Crack initiation and growth due to SCC	Plant specific	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.7)
Pressurizer instrumentation penetrations and heater sheaths and sleeves made of nickel alloys **Item Number 3.1.1-14**	Crack initiation and growth due to PWSCC	Inservice inspection; water chemistry	None	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.7)
Westinghouse and B&W baffle/former bolts **Item Number 3.1.1-15**	Crack initiation and growth due to SCC and irradiation assisted stress corrosion cracking (IASCC)	Plant specific	Water Chemistry Control Program (Appendix B.3.2); Reactor Vessel Internals Program (Appendix B.5.1)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.8)
Westinghouse and B&W baffle/former bolts **Item Number 3.1.1-16**	Loss of preload due to stress relaxation	Plant specific	Reactor Vessel Internals program (Appendix B.5.1); Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.9)
Steam Generator feedwater impingement plate and support **Item Number 3.1.1-17**	Loss of section thickness due to erosion	Plant specific	None	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.10)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Alloy 600 Steam Generator tubes, repair sleeves, and plugs **Item Number 3.1.1-18**	Crack initiation and growth due to PWSCC, outside diameter stress corrosion cracking (ODSCC), and/or intergranular (IGA); or loss due to wastage and pitting corrosion, and fretting and wear; or deformation due to corrosion at tube support plate intersections	Steam generator tubing integrity; water chemistry	Steam Generator program (Appendix B.3.8); Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.11)
Tube support lattice bars made of carbon steel **Item Number 3.1.1-19**	Loss of section thickness due to flow-accelerated corrosion (FAC)	Plant specific	None	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.12)
Carbon steel tube support plate **Item Number 3.1.1-20**	Ligament cracking due to corrosion	Plant specific	None	Consistent with GALL, which recommends further evaluation. (See Section 3.1.2.2.13)
Steam generator feedwater inlet ring and supports **Item Number 3.1.1-21**	Loss of material due to FAC	Combustion engineering Steam Generator feedwater ring inspection	None	Not applicable to FNP (See Section 3.1.2.2.14)
Reactor vessel closure studs and stud assembly **Item number 3.1.1-21**	Crack initiation and growth due to SCC and/or IGSCC	Reactor head closure studs	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
CASS pump casing and valve body **Item Number 3.1.1-23**	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
CASS piping **Item Number 3.1.1-24**	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
BWR piping and fittings; Steam Generator components **Item Number 3.1.1-25**	Wall thinning due to FAC	FAC	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
RCPB valve closure bolting, manway and holding bolting, and closure bolting in high-pressure and high-temperature systems **Item Number 3.1.1-26**	Loss of material due to wear; loss of preload due to stress relaxation; crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
CRD nozzle **Item Number 3.1.1-35**	Crack initiation and growth due to PWSCC	Nickel-alloy nozzles and penetrations; water chemistry	Inservice Inspection Program (Appendix B.3.1); NiCrFe Component assessment Program (Appendix B.5.8); Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Reactor vessel nozzles safe ends and CRD housing; reactor coolant system components (except CASS and bolting) **Item Number 3.1.1-36**	Crack initiation and growth due to cyclic loading, and/or SCC and PWSCC	Inservice inspection; water chemistry	Inservice Inspection Program (Appendix B.3.1); NiCrFe Component Assessment Program (Appendix B.5.8); Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Reactor vessel internals CASS components **Item Number 3.1.1-37**	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement, and void swelling	Thermal aging and neutron irradiation embrittlement	Reactor Vessel Internals Program (Appendix B.5.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.2.6)
External surfaces of carbon steel components in reactor coolant system pressure boundary **Item Number 3.1.1-38**	Loss of material due to boric acid corrosion	Boric acid corrosion	Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steam generator secondary manways and handholds (carbon steel) **Item Number 3.1.1-39**	Loss of material due to erosion	Inservice inspection	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Reactor internals, reactor vessel closure studs, and core support pads **Item Number 3.1.1-40**	Loss of material due to wear	Inservice Inspection	Inservice Inspection Program (Appendix B.3.1); Flux Detector Thimble Tube Inspection Program (Appendix B.5.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Pressurizer integral support **Item Number 3.1.1-41**	Crack initiation and growth due to cyclic loading	Inservice inspection	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Upper and lower internals assembly (Westinghouse) **Item Number 3.1.1-42**	Loss of preload due to stress relaxation	Inservice inspection; loose part and/or neutron noise monitoring	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.2.9)
Reactor vessel internals in fuel zone region (except Westinghouse and B&W baffle/former bolts) **Item Number 3.1.1-43**	Loss of fracture toughness due to neutron irradiation embrittlement and void swelling	PWR vessel internals; water chemistry	Reactor Vessel Internals Program (Appendix B.5.1); Water Chemistry Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Steam generator upper and lower heads, tubesheets, and primary nozzles and safe ends **Item Number 3.1.1-44**	Crack initiation and growth due to SCC, PWSCC, and/or IASCC	Inservice inspection; water chemistry	Inservice Inspection Program (Appendix B.3.1); NiCrFe Component Assessment Program (Appendix B.5.8); Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Vessel internals (except Westinghouse and B&W baffle/former bolts) **Item Number 3.1.1-45**	Crack initiation and growth due to SCC and IASCC	PWR vessel internals; water chemistry	Reactor Vessel Internals Program (Appendix B.5.1); Water Chemistry Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Reactor internals (B&W screws and bolts) **Item Number 3.1.1-46**	Loss of preload due to stress relaxation	Inservice inspection; loose part monitoring	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Reactor vessel closure studs and stud assembly **Item Number 3.1.1-47**	Loss of material due to wear	Reactor head closure studs	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)
Reactor internals (Westinghouse upper and lower internal assemblies, CE bolts and tie rods) **Item Number 3.1.1-48**	Loss of preload due to stress relaxation	Inservice inspection; loose part monitoring	Inservice Inspection Program (B.3.1); Reactor Vessel Internals Program (Appendix B.5.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.1.2.1)

The staff's review of the applicant's reactor vessel, internals, and RCS and associated components followed one of several approaches. One approach, documented in Section 3.1.2.1, involved the staff's review of the AMR results for components and component groups in the reactor vessel, internals, and RCS that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in Section 3.1.2.2, involved the staff's review of the AMR results for components and component groups in the reactor vessel, internals, and RCS that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in Section 3.1.2.3, involved the staff's review of the AMR results for components and component groups in the reactor vessel, internals, and RCS that the applicant indicated are not consistent with the GALL Report or are not addressed in the GALL Report. Section 3.0.3 of this SER documents the staff's review of AMPs that the applicant credited to manage or monitor aging effects of the RCS components.

3.1.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Not Recommended

Summary of Technical Information in the Application

In Sections 3.1.2.1.1 through 3.1.2.1.4 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the reactor vessel internals and RCS components:

- Inservice Inspection Program
- Water Chemistry Control Program
- Reactor Vessel Surveillance Program
- Borated Water Leakage Assessment and Evaluation Program

- Steam Generator Program
- Reactor Vessel Internals Program
- Flux Detector Thimble Tube Inspection Program
- One-Time Inspection Program
- NiCrFe Component Assessment Program

Staff Evaluation

In Tables 3.1.2-1 through 3.1.2-4 of the LRA, the applicant summarized the AMRs for the reactor vessel internals and RCS and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the staff performed an audit and review to determine whether the GALL Report evaluation bounded the plant-specific components contained in these GALL Report component groups. The staff also identified several areas where it needed additional information or clarification. The following describes the staff's evaluation of the applicant's responses to those RAIs.

3.1.2.1.1 Crack Initiation and Growth Due to Cyclic Loading, and/or Stress-Corrosion Cracking and Primary Water Stress-Corrosion Cracking (Table 3.1.1, Item 3.1.1-36)

In Table 3.1.2-3 of the LRA, the applicant did not credit the Inservice Inspection Program to manage cracking of non-Class 1 piping and valve components. However, Table 3.1.1, Item 3.1.1-36, of the LRA (linked to the non-Class 1 piping and valve bodies) states the following:

> The AMR results are consistent with this summary item. Consistent with NUREG-1801, the water chemistry program and ISI program will manage cracking of these components.

The staff noted the inconsistency between Table 3.1.1 and Table 3.1.2-3 of the LRA and requested that the applicant explain whether it credited the Inservice Inspection Program for the non-Class 1 piping and valve bodies and, if it did credit the Inservice Inspection Program, to correct the inconsistency between the two tables. The staff identified this issue as RAI 3.0-1A.

By letter dated April 16, 2004, the applicant provided its response to RAI 3.0-1A. In its response, the applicant stated that it did not credit the Inservice Inspection Program for managing cracking of non-Class 1 piping and valve components. For clarity, the applicant stated that the second paragraph of the discussion text contained in Table 3.1.1, Item 3.1.1-36, of the LRA should have read as follows:

> While the water chemistry control program and the inservice inspection program are credited, inservice inspection for this group is primarily directed at welded connections in ASME Class 1 components. The water chemistry control program alone will manage cracking of the non-welded portions of ASME Class 1 components/component types within this group and all non-ASME Class 1 components/component types within this group.

This is consistent with the GALL Report, Volume 2, Section IV.C2, which recommends ISI and water chemistry control for Class 1 components but only water chemistry control for non-Class 1 components. This is also consistent with other non-Class 1 components in the same material-environment combination for systems in the GALL Report, Volume 2, Chapter V. Based on the above discussion and review of the applicant's response, the staff finds that this line item is acceptable.

On the basis of its review, the staff determined that for AMRs not requiring further evaluation, as identified in Table 3.1.1 of the LRA (Table 1), the applicant's references to the GALL Report are acceptable and no further staff review is required. The FNP Audit and Review Report documents the details of the staff's audit and review.

On the basis of its review, the staff has evaluated the applicant's claim of consistency with the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.1.2 Loss of Fracture Toughness Due to Thermal aging Embritttlement (Table 3.1.1, Item 3.1.1-24)

In Table 3.1.1, Item 3.1.1-24 of the LRA, the applicant states that no program is required to manage loss of fracture toughness of the FNP reactor coolant system cast austenitic stainless steel piping and fittings due to thermal aging embrittlement. In Section 4.5.2 of the LRA, the applicant states that it has updated the original leak before break analyses to address the period of extended operation. The results of this calculation update indicate that adequate toughness remains to ensure that an adequate margin exists between the critical crack size and the postulated crack size that yields a detectable leak rate.

The staff acknowledges that updating the leak-before-break analyses validates and demonstrates that the leak-before-break is acceptable for the period of extended operation. However, the leak-before-break analyses do not demonstrate that the effects of aging will be adequately managed in accordance with the requirements of 10 CFR 54.21(a)(3). The GALL Report recommends that either enhanced volumetric examination or flaw tolerance evaluation be performed to manage the aging effects for CASS components.

The staff requested that the applicant provide a justification for leak-before-break analyses as the flaw tolerance evaluation which manages this aging effect. Otherwise, the applicant is requested to identify which alternative, enhanced volumetric examination or flaw tolerance evaluation will be used to manage this aging effect during the period of extended operation.

By letter dated August 19, 2004 (SNC Letter No. NL-04-1486), the applicant provided its supplemental information to the LRA. In its response, the applicant stated that, consistent with GALL Report, it will use enhanced volumetric examination or a flaw tolerance evaluation to demonstrate that CASS piping components potentially susceptible to thermal embrittlement have adequate fracture toughness.

The applicant further stated that in LRA Table 3.1.2-3, the CASS "Piping, Class 1 (Reactor Coolant Loop)" component type is revised to include loss of fracture toughness as an aging effect in the borated water environment. The associated NUREG-1801 Volume 2 Item is "IV.C2.1-f" and the Table 1 Item is "3.1-24." The staff reviewed the applicant's response, found the response consistent with the GALL report recommendation and, therefore, is acceptable.

3.1.2.1.3 Loss of Fracture Toughness Due to Thermal Aging, Irradiation Embrittlement, and Void Swelling (Table 3.1.1, Item 3.1.1-37)

In reviewing Item 3.1.1-37 of the LRA, the staff noted that the applicant took an exception and applied a higher threshold value for neutron fluence effects on stainless steel than does the GALL Report. However, this exception is not identified in Appendix B.5.1, "Reactor Vessel Internals Program," of the LRA.

In RAI 3.1-1, the staff requested that the applicant submit justification for using the higher neutron threshold value. In its response to RAI 3.1-1, by letter dated March 5, 2004, the applicant stated that SNC applies a threshold value for neutron fluence effects on stainless steels of $1x10^{21}$ n/cm^2 (E>0.1 MeV). This value is consistent with WCAP-14577-A, Revision 1, "License Renewal Evaluation: Aging Management of Reactor Internals," dated March 2001, which has been accepted by staff. The applicant further stated that the reactor vessel internal components with the highest neutron fluence are considered to have the highest susceptibility to irradiation induced degradation and therefore are the leading indicators for inspection. The reactor vessel internals program (AMP B.5.1) provides for inspection and monitoring of these leading locations.

The staff finds the applicant's response acceptable because the staff has accepted the higher neutron fluence value for stainless steel as identified in WCAP-14577A, Revision 1, dated March 2001, and the applicant did include components with the highest fluence value in the reactor vessel internals program for inspection and monitoring.

Conclusion

The staff has evaluated the applicant's claim of consistency with GALL Report. The staff has also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Recommended

Summary of Technical Information in the Application

In Section 3.1.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for the reactor vessel, internals, and RCS. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to pitting and crevice corrosion

- loss of fracture toughness due to neutron irradiation embrittlement

- crack initiation and growth due to thermal and medical loading or stress-corrosion cracking

- crack growth due to cyclic loading

- changes in dimension due to void swelling

- crack initiation and growth due to stress-corrosion cracking or PWSCC

- crack initiation and growth due to stress-corrosion cracking or IASCC

- loss of preload due to stress relaxation

- loss of section thickness due to erosion

- cracking initiation and growth due to PWSCC, ODSCC, or intergranular attack or loss of material due to wastage and pitting corrosion or loss of section thickness due to fretting and wear or denting due to corrosion of carbon steel tube support plate

- loss of section thickness due to flow-accelerated corrosion

- ligament cracking due to corrosion

- loss of material due to flow-accelerated corrosion (PWR)

Staff Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's analysis to determine whether it adequately addressed these issues. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in Section 3.1.2.2 of the SRP-LR. The FNP Audit and Review Report documents the details of the staff's audit and review.

The GALL Report indicates that further evaluation should be performed for the aging effects described in the following sections of this SER.

3.1.2.2.1 Cumulative Fatigue Damage

As stated in the SRP-LR, fatigue is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). Section 4.3 of this SER documents the staff's review of the applicant's evaluation of this TLAA. In performing this review, the staff followed the guidance in Section 4.3 of the SRP-LR.

3.1.2.2.2 Loss of Material Due to Pitting and Crevice Corrosion

Section 3.1.2.2.2 of the SRP-LR states that the loss of material due to pitting and crevice corrosion could occur in the SG shell assembly. The existing program relies on control of water chemistry to mitigate corrosion and ISI to detect the loss of material. The extent and schedule of the existing SG inspections ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. However, according to NRC IN 90-04, “Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators,” dated January 26, 1990, if pitting and crevice corrosion of the shell exists, the program may not be sufficient to detect pitting and corrosion. The GALL Report recommends augmented inspections to manage this aging effect. This IN also identifies operating experience with the pitting of Westinghouse SG models 44 and 51.

For managing the aging of SG assemblies due to pitting and crevice corrosion, the GALL Report recommends the ASME Code, Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD (XI.M1) program to detect the loss of material and the water chemistry (XI.M2) program to mitigate corrosion. The GALL Report recommends a plant-specific program to conduct augmented inspections.

In LRA Table 3.1.2-4, page 3.1-79, for upper shells, lower shells, and transition cone component type, the applicant has credited Water Chemistry Control Program alone for the loss of material aging effect. The LRA also references GALL Section IV.D1.1-c, Table 1, Item 3.1.1-2, and note A. Note A is defined as “consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.”

Item IV.D1.1-c of the GALL Report recommends the water chemistry control program and ISI program to manage the aging effect for loss of material. Thus, note A does not apply. In addition, SRP Section 3.1.2.2.2 states that the combination of the water chemistry control program and ISI program may not be enough, and augmented inspections may be required. In LRA Section 3.1.2.2.2, the applicant stated that it uses the Water Chemistry Control Program to manage the loss of material, but it uses the Inservice Inspection Program to manage cracking. This section only addresses the loss of material due to pitting and crevice corrosion. The applicant also stated that no augmented inspections are required because the SGs were replaced, and, since then, the applicant has maintained water chemistry per EPRI standards. However, LRA Section 3.1.2.2.2 did not state that the applicant will perform ISI for the loss of material or that it would also use the ISI that is performed for managing cracking for the loss of material. The staff requested the applicant to provide clarification during a teleconference on July 6, 2004, as documented by the staff in a summary dated July 20, 2004.

By letter dated July 16, 2004, the applicant provided its supplemental information to LRA Section 3.1. In its response, the applicant stated that, for the upper shells, lower shells, and transition cones component type, it should not have applied GALL Report Item IV.D1.1-c to cracking, only to loss of material. The applicant should have applied LRA note H to the cracking line item instead of notes A and 9. The applicant also stated that for the upper shells, lower shells, and transition cones component type, it considered crack growth due to cyclic loading as an AERM, with existing ASME Code, Section XI, inspection requirements performed by the Inservice Inspection Program credited to manage cracking. For the loss of material associated with the upper shells, lower shells, and transition cones, the AMPs listed should have included both the Water Chemistry Control Program and the Inservice Inspection Program. Water chemistry controls directly mitigate the loss of material within the SG shell assemblies. The Inservice Inspection Program inspections are not specifically designed to detect the loss of material due to corrosion. However, ASME Code Section XI requirements implemented by the

Inservice Inspection Program are designed to identify any flaws large enough to potentially result in a loss of component intended function, whether caused by cracking, loss of material, or a combination of the two aging effects. The Water Chemistry Control Program alone manages the loss of material associated with these components. Therefore, the applicant indicated in its response that FNP manages the loss of material of these components consistently with those specified in GALL Report, Item IV.D1.1-c, and note A applies. Based on the above discussion, the staff finds that this line item is acceptable.

In IN 90-04, the NRC identified the need to augment inspections beyond the requirements of ASME Code, Section XI, if general corrosion pitting of the SG shell is known to exist in order to differentiate isolated cracks for inherent geometric conditions. The applicant replaced the SGs at FNP, Units 1 and 2, in 2000 and 2001, respectively, with Westinghouse model 54F replacement SGs.

The staff reviewed operating experience which indicated that no pitting corrosion of the SG shell has been detected to date, and that water chemistry has been maintained for these new SGs per EPRI guidelines. Since the applicant recently replaced the SGs and has strictly maintained water chemistry per EPRI guidelines, the staff concludes that the applicant has adequately addressed the management of this aging effect and that augmented inspections are not required. Sections 3.0.3.2.1 and 3.0.3.1 of this SER discuss the staff's review of the Water Chemistry Control Program and the Inservice Inspection Program, respectively.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to pitting and crevice corrosion, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

Section 3.1.2.2.3 of the LRA addresses (1) loss of fracture toughness due to neutron irradiation embrittlement for ferritic materials in the reactor vessel (RV), as managed using both a plant specific AMP and the TLAAs on neutron irradiation embrittlement, and (2) loss of fracture toughness due to irradiation embrittlement and changes in material properties due to void swelling.

Section 3.1.2.2.3 of the SRP-LR states that certain aspects of neutron irradiation embrittlement are TLAAs, as defined in 10 CFR 54.3, and that TLAAs must be evaluated in accordance with 10 CFR 54.21(c)(1). Section 3.1.2.2.3 also states that the loss of fracture toughness due to neutron irradiation embrittlement could occur in the reactor vessel. 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 Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to 10 CFR Part 50, an applicant must submit its proposed withdrawal schedule for approval before implementation. Finally, SRP-LR Section 3.1.2.2.3 states that loss of fracture toughness due to neutron irradiation embrittlement and void swelling could occur in Westinghouse and Babcock and Wilcox (B&W) baffle/former bolts.

For managing loss of fracture toughness due to neutron irradiation embrittlement in the reactor vessel, the GALL Report recommends AMP XI.M31, “Reactor Vessel Surveillance,” which complies with the requirements of Appendices G and H to 10 CFR Part 50 and 10 CFR Part 50.61.

Section 4.2 of the LRA describes the TLAA regarding the loss of fracture toughness due to neutron irradiation embrittlement for ferritic materials that have a neutron fluence of greater than 10^{17}n/cm^2 at the end of the license renewal term. Section 4.2 of this SER documents the staff’s review of the applicant’s evaluation of this TLAA. In performing this review, the staff followed the guidance in Section 4.2 of the SRP-LR.

The applicant stated that the Reactor Vessel Surveillance Program (AMP B.3.4), as supported by associated TLAA evaluations (Section 4.2 of the LRA), will manage the loss of fracture toughness of reactor vessel beltline components due to irradiation embrittlement by addressing the limiting beltline shells and welds. The Reactor Vessel Surveillance Program includes a capsule withdrawal schedule that provides sufficient data to assess the effects of irradiation embrittlement on the beltline components during the period of extended operation. The applicant submitted the reactor vessel capsule withdrawal schedule in a separate LRA supplement letter dated December 5, 2003. Section 3.0.3.2.2 of this SER addresses the staff’s review of this withdrawal schedule.

The applicant stated that the loss of fracture toughness due to neutron irradiation embrittlement and void swelling could occur in Westinghouse and B&W baffle/former assembly bolts. The GALL Report states that the applicant must provide a plant-specific AMP to manage this potential aging effect.

The applicant credited the Reactor Vessel Internals Program (AMP B.5.1) with managing the aging effect of loss of fracture toughness due to neutron irradiation embrittlement and void swelling. In 1998/1999, the applicant replaced a number of baffle/former bolts with an improved design. As summarized in SER Section 3.0.3.2.7, the applicant has made the following commitments on the Reactor Vessel Internals Program: (1) continued participation in the EPRI MRP’s industry initiatives on degradation of RV internals components, (2) implementation of those recommended programs and activities that result from these initiatives, as applicable to the design of the Farley RV internals, and (3) submittal of an inspection for the Farley RV internals for staff review and approval at least 24 months prior to entering the periods of extended operation for the Farley units. Section 3.0.3.2.7 of this SER documents the staff’s evaluation of the Reactor Vessel Internals Program.

The applicant’s commitment for the Reactor Vessel Internals Program is included in its letter dated July 27, 2004 (SNC Letter No. NL-04-1267). Based on its review of the proposed revised commitment list, the staff concludes that the applicant has adequately addressed issues related to change in dimension due to void swelling and loss of fracture toughness due to neutron irradiation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving management of the loss of fracture toughness due to neutron irradiation embrittlement and void swelling, as recommended in the GALL Report. Since the applicant’s AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.4 Crack Initiation and Growth Due to Thermal and Mechanical Loading or Stress-Corrosion Cracking

In Section 3.1.2.2.4 of the LRA, the applicant addressed the potential for crack initiation and growth due to thermal and mechanical loading or stress-corrosion cracking (SCC) (including intergranular stress-corrosion cracking (IGSCC)) that could occur in small-bore RCS and connected system piping less than 4 inch nominal pipe size (NPS 4).

Section 3.1.2.2.4 of the SRP-LR states that the GALL Report recommends conducting a plant-specific destructive examination or an NDE that permits inspection of the inside surfaces of the piping to ensure that cracking has not occurred and the component intended function will be maintained during the period of extended operation. The applicant should verify that service-induced weld cracking is not occurring in small-bore piping less than NPS 4. A one-time inspection of a sample of locations is an acceptable method to ensure that the aging effect is not occurring and that the component intended function will be maintained during the period of extended operation. Per ASME Code, Section XI, 1995 Edition, Examination Category B-J or B-F, small-bore piping, defined as piping less than NPS 4, does not receive volumetric inspection.

The GALL Report recommends AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," to detect loss of material and AMP XI.M2, "Water Chemistry," to mitigate SCC.

The applicant credited the Inservice Inspection Program (AMP B.3.1), Water Chemistry Control Program (AMP B.3.2), and One-Time Inspection Program (AMP B.5.5) to manage the aging effects of cracking for small-bore RCS and connected systems piping. The staff evaluated these programs in Sections 3.0.3.1, 3.0.3.2.1, and 3.0.3.1 of this SER, respectively. In addition, this group of programs is consistent with the group of programs recommended by the GALL Report. The applicant submitted a risk-informed ISI (RI-ISI) program for NRC approval in July 2003. By letter dated March 9, 2004, the staff approved the RI-ISI program. The risk-informed methodology will be used to select the small-bore Class 1 butt weld locations for the one-time volumetric examinations, but it will not be used to eliminate small-bore Class 1 butt welds from the scope of these one-time examinations. During a teleconference on June 23, 2004, the staff requested supplemental information in reference to LRA Section 3.1.2.2.4 and the corresponding item 7 in LRA Table 3.1.1. The staff specifically requested the applicant to provide the number of ASME Code, Class 1 small-bore piping weld locations that are in the scope of the LRA under RI-ISI that will be volumetrically examined.

By letter dated July 9, 2004, the applicant provided its supplemental response to LRA Section 3.1.2.4. In its response, the applicant stated that the RI-ISI program includes volumetric examination of one ASME Code, Class 1, small-bore (defined as piping less than NPS 4) piping segment per unit, specifically, the 2-inch drainline that tees off of the 3-inch nominal letdown line in each unit. The applicant stated that the 2-inch circumferential butt weld at the tee in each unit is scheduled for ultrasonic examination under the RI-ISI program. The applicant further stated that the One-Time Inspection Program will provide examination of small-bore ASME Class 1 piping to confirm that cracking (due to thermal cycling or SCC) is not occurring in these lines.

As a clarification, the applicant stated that examinations performed under the RI-ISI program that permit inspection of the inside surfaces (e.g., volumetric examination) of the small-bore ASME Class 1 piping will be included as part of the representative sample for the One-Time Inspection Program as applicable. Based on the above discussion, the staff finds that this line item is acceptable.

On the basis of its review, the staff concludes that the applicant has appropriately evaluated AMR results involving the management of crack initiation and growth due to thermal and mechanical loading or SCC for small-bore RCS and connected system piping, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.5 Crack Growth Due to Cyclic Loading

In Section 3.1.2.2.5 of the LRA, the applicant addressed crack growth due to cyclic loading that could occur in reactor vessel shell and RCS piping and fittings.

Section 3.1.2.2.5 of the SRP-LR states that growth of intergranular separations (underclad cracks) in low-alloy or carbon steel heat-affected zones under austenitic stainless steel cladding is a TLAA to be evaluated for the period of extended operation for all the SA 508-Class 2 forgings where the cladding was deposited with a high heat input welding process. The methodology for evaluating the underclad flaws should be consistent with the current well-established flaw evaluation procedure and criterion in ASME Code, Section XI. The GALL Report recommends further evaluation of programs to manage crack growth due to cyclic loading in RV shell and RCS piping and fittings.

In Section 3.1.2.2.5 of the LRA, the applicant stated that underclad cracking of reactor vessel and RCS clad alloy steel forgings is not a TLAA for FNP. The applicant stated that all clad alloy steel forgings are not SA 508-Class 2, or they did not use a high heat input welding process for clad deposition. The applicant stated that the reactor vessel shells were fabricated from SA-533, Grade B, plates. Moreover, the applicant has not identified any underclad cracking at FNP.

The staff reviewed Section 3.1.2.2.5 of the LRA and agreed that underclad cracking is not an applicable aging effect for these forgings, since they are not made of SA 508-Class 2 material, or the high heat input welding processes affecting underclad cracking (i.e., strip clad and manual inert gas cladding processes) were not used to apply cladding to these components.

3.1.2.2.6 Changes in Dimension Due to Void Swelling

In Section 3.1.2.2.6 of the LRA, the applicant addressed changes in dimension due to void swelling that could occur in reactor internal components.

Section 3.1.2.2.6 of the SRP-LR states that the GALL Report recommends evaluation of changes in dimension due to void swelling in reactor internal components to ensure that this aging effect is adequately managed. The GALL Report recommends evaluation of a plant-specific AMP to manage the effects of changes in dimension due to void swelling and the loss of ductility associated with swelling.

The applicant credited the Reactor Vessel Internals Program (AMP B.5.1) to manage changes in material properties due to void swelling, which could occur in the PWR reactor vessel internals. The applicant stated that this new program is consistent with GALL AMP XI.M16, “PWR Vessel Internals.” The applicant considered the baffle/former assemblies, including baffle/former bolting, to be leading indicators for void swelling. Section 3.0.3.2.7 of this SER documents the staff’s evaluation of the Reactor Vessel Internals Program. The applicant further stated that it will continue to participate actively in industry efforts to quantify the nature and extent of void swelling in the PWR environment. The applicant will update the Reactor Vessel Internals Program based upon the results of these industry initiatives.

As summarized in SER Section 3.0.3.2.7, the applicant has made the following commitments on the Reactor Vessel Internals Program: (1) continued participation in the EPRI MRP’s industry initiatives on degradation of RV internals components, (2) implementation of those recommended programs and activities that result from these initiatives, as applicable to the design of the Farley RV internals, and (3) submittal of an inspection for the Farley RV internals for staff review and approval at least 24 months prior to entering the periods of extended operation for the Farley units. The staff evaluates these commitments in Section 3.0.3.2.7 of this SER. Section 3.0.3.2.7 of this SER provides the staff’s evaluation of the licensee commitments on the RV internal components (including baffle/former bolts), and the staff’s basis for concluding that the applicant’s commitments for the Reactor Vessel Internals Program are adequate to manage void swelling in these components.

On the basis of its review and the applicant’s commitments discussed and evaluated in Section 3.0.3.2.7 of this SER, the staff finds that the applicant has appropriately evaluated AMR results involving the management of changes in dimension and material properties due to void swelling in the baffle/former plates, as recommended in the GALL Report. Since the applicant’s AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Crack Initiation and Growth Due to Stress-Corrosion Cracking or Primary Water Stress-Corrosion Cracking

In Section 3.1.2.2.7 of the LRA, the applicant addressed (1) crack initiation and growth due to SCC and PWSCC that could occur in core support pads (or core guide lugs), instrument tubes (bottom head penetrations), pressurizer spray heads, and nozzles for the SG instruments and drains; (2) crack initiation and growth due to SCC that could occur in CASS RCS piping and fittings and pressurizer surge line nozzles; and (3) crack initiation and growth due to PWSCC that could occur in pressurizer instrumentation penetrations and heater sheaths and sleeves made of nickel alloys.

Section 3.1.2.2.7 of the SRP-LR provides the following three criteria:

(1) Crack initiation and growth due to SCC and PWSCC could occur in core support pads (or core guide lugs), instrument tubes (bottom head penetrations), pressurizer spray heads, and nozzles for the SG instruments and drains. The GALL Report recommends

further evaluation to ensure that these aging effects are adequately managed. The GALL Report recommends evaluation of a plant-specific AMP because existing programs may not be capable of mitigating or detecting crack initiation and growth due to SCC.

(2) Crack initiation and growth due to SCC could occur in RCS piping and fittings and CASS pressurizer surge line nozzles. The GALL Report recommends further evaluation of piping that does not meet either the reactor water chemistry guidelines of EPRI TR-105714, "PWR Primary Water Chemistry Guidelines," or material guidelines of NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping."

(3) Crack initiation and growth due to PWSCC could occur in pressurizer instrumentation penetrations and heater sheaths and sleeves made of nickel alloys. The existing program relies on ASME Code, Section XI, ISI and on control of water chemistry to mitigate PWSCC. However, the existing program should be augmented to manage the effects of SCC on the intended function of nickel-alloy components. The GALL Report recommends that the applicant provide a plant-specific AMP or participate in industry programs to determine appropriate AMPs for PWSCC of the Alloy 182 weld.

The applicant credited the following plant-specific programs for each of the three SRP-LR criteria:

(1) The applicant will use a combination of the Water Chemistry Control program and the NiCrFe Component Assessment Program. If augmented inspections are required, then the applicant will incorporate these inspections into the Inservice Inspection Program. The GALL AMP XI.M11, "Nickel-Alloy Nozzles and Penetrations," for NiCrFe alloy material includes an assessment and use of ISI for inspection.

(2) The applicant will use the Water Chemistry Control Program to mitigate the effects of cracking due to SCC. The program implements the guidance contained in EPRI TR-105714 and is consistent with the GALL Report.

(3) The pressurizer instrumentation penetrations and heater sheaths and sleeves are fabricated from stainless steel material at FNP; therefore, this criterion does not apply to FNP.

<u>Crack Initiation and Growth Due to SCC and PWSCC</u>

In Section 3.1.2.2.7.1 of the LRA, the applicant included two nickel alloy components, core support lugs and bottom head penetrations. The applicant credited (1) the NiCrFe Component Assessment Program (AMP B.5.8), (2) the Water Chemistry Control Program (AMP B.3.2) and, (3) if the assessment shows that augmented inspection requirements are required, the Inservice Inspection Program (AMP B.3.1) to manage crack initiation and growth due to PWSCC of these components.

Sections 3.0.3.3.3, 3.0.3.2.1, and 3.0.3.1 of this SER document the staff's evaluation of the NiCrFe Component Assessment Program, Water Chemistry Control Program, and Inservice Inspection Program, respectively. The GALL AMP XI.M11 program for NiCrFe alloy material includes an assessment and use of ISI for inspection. The staff concluded that the NiCrFe Component Assessment Program and the Inservice Inspection Program are similar to the GALL Report AMP XI.M11 program, which includes an assessment and uses the ISI program for detection of aging effects, if required. Therefore, the programs are acceptable. The staff also concluded that the Water Chemistry Control Program is acceptable since the program implements the guidance contained in EPRI TR-105714 and is consistent with the GALL Report.

<u>Crack Initiation and Growth Due to SCC</u>

The applicant conservatively includes AMR of the pressurizer spray head by crediting the water chemistry control program (AMP B.3.2) and the one-time inspection program (AMP B.5.5) to manage cracking initiation and growth due to SCC. This is acceptable since the spray head is not within the scope of license renewal based on the Westinghouse Commercial Atomic Power (WCAP) 14574-A, "License Renewal Evaluation: Aging Management Evaluation for Pressurizers," dated December 2002. The NRC staff has accepted this basis.

The applicant credited the Water Chemistry Control Program (AMP B.3.2) to manage crack initiation and growth due to SCC in CASS RCS piping and fittings. The program implements the guidance contained in EPRI TR-105714.

Section 3.0.3.2.1 of this SER documents the staff's evaluation of this program. Since the applicant's AMR for the CASS components indicated that the primary water chemistry is maintained in accordance with the chemistry guidelines of EPRI TR-105714, Revision 3, the staff concludes that the AMR for the CASS components is consistent with the GALL Report and is, therefore, acceptable.

<u>Crack Initiation and Growth Due to PWSCC in Pressurizer Instrumentation Penetrations and Heater Sheaths and Sleeves Made of Nickel Alloys</u>

The applicant stated that the pressurizer instrumentation penetrations and heater sheaths are made of austenitic stainless steel and are not susceptible to PWSCC. The staff reviewed Section 3.1.2.2.7 of the LRA and concludes that the pressurizer instrument penetrations and heater sheaths are fabricated from austenitic stainless steel and not nickel alloys and, therefore, the applicant's approach is acceptable.

On the basis of its review, the staff concludes that the applicant has adequately evaluated the management of crack initiation and growth due to SCC or PWSCC for RCS components discussed in this section. Based on this conclusion, and the confirmation that the remainder of the applicant's program is consistent with the GALL Report, the staff concludes that this aging effect will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.8 Crack Initiation and Growth Due to Stress-Corrosion Cracking or Irradiation-Assisted Stress-Corrosion Cracking

In Section 3.1.2.2.8 of the LRA, the applicant addressed crack initiation and growth due to SCC or IASCC that could occur in baffle/former assembly bolts in the reactor internals.

Section 3.1.2.2.8 of the SRP-LR states that crack initiation and growth due to SCC or IASCC could occur in baffle/former assembly bolts in Westinghouse and B&W reactors. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

The applicant credited the Reactor Vessel Internals Program (AMP B.5.1) and the Water Chemistry Control Program (AMP B.3.2) to manage these aging effects. The applicant recently replaced these bolts, and testing of the replaced bolts indicated that no significant degradation had occurred. The applicant stated that since the bolts were replaced, it would expect to see the lower end of life fluence, and with the improved stress profile and excellent operating history to date, the applicant does not plan to perform any volumetric inspection.

The GALL Report states that the industry is currently addressing the issue of baffle bolt cracking in the PWR MRP ITG activities to determine, develop, and implement the necessary steps and plans to manage the applicable aging effects on a plant-specific basis.

As summarized in SER Section 3.0.3.2.7, the applicant has made the following commitments on the Reactor Vessel Internals Program: (1) continued participation in the EPRI MRP's industry initiatives on degradation of RV internals components, (2) implementation of those recommended programs and activities that result from these initiatives, as applicable to the design of the Farley RV internals, and (3) submittal of an inspection for the Farley RV internals for staff review and approval at least 24 months prior to entering the periods of extended operation for the Farley units. Section 3.0.3.2.7 of this SER provides the staff's evaluation of the licensee commitments on the RV internal components (including baffle/former bolts), and the staff's basis for concluding that the applicant's commitments for the Reactor Vessel Internals Program are adequate to manage cracking in these components.

The staff evaluates the Water Chemistry Control Program in Section 3.0.3.2.1 of this SER and the Reactor Vessel Internals Program in Section 3.0.3.2.7 of this SER.

On the basis of its review and the applicant's commitments discussed and evaluated in Section 3.0.3.2.7 of this SER, the staff finds that the applicant has appropriately evaluated AMR results involving the management of crack initiation and growth due to SCC or IASCC for the baffle/former plates, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.9 Loss of Preload Due to Stress Relaxation

In Section 3.1.2.2.9 of the LRA, the applicant addressed the loss of preload due to stress relaxation that could occur in baffle/former assembly bolts in the reactor.

Section 3.1.2.2.9 of the SRP-LR notes that loss of preload due to stress relaxation could occur in baffle/former assembly bolts. The GALL Report states that the applicant must provide a plant-specific AMP to manage this potential aging effect.

The applicant credited the Reactor Vessel Internals Program (AMP B.5.1), in combination with visual inspections performed under the Inservice Inspection Program (AMP B.3.1), to manage the aging effect of loss of preload due to stress relaxation in baffle/former assembly bolts. The applicant stated that it replaced these bolts at FNP; during the replacement project, the applicant did not note any indications of significant stress relaxation.

As summarized in SER Section 3.0.3.2.7, the applicant has made the following commitments on the Reactor Vessel Internals Program: (1) continued participation in the EPRI MRP's industry initiatives on degradation of RV internals components, (2) implementation of those recommended programs and activities that result from these initiatives, as applicable to the design of the Farley RV internals, and (3) submittal of an inspection for the Farley RV internals for staff review and approval at least 24 months prior to entering the periods of extended operation for the Farley units. Section 3.0.3.2.7 of this SER provides the staff's evaluation of the licensee commitments on the RV internal components (including baffle/former bolts), and the staff's basis for concluding that the applicant's commitments for the Reactor Vessel Internals Program are adequate to manage loss of preload due to stress relaxation in these components.

The staff evaluates the Inservice Inspection Program in Section 3.0.3.1 of this SER and the Reactor Vessel Internals Program in Section 3.0.3.2.7 of this SER.

On the basis of its review and the applicant's commitments discussed and evaluated in Section 3.0.3.2.7 of this SER, the staff finds that the applicant has appropriately evaluated AMR results involving the management of the loss of preload due to stress relaxation, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.10 Loss of Section Thickness Due to Erosion

In Section 3.1.2.2.10 of the LRA, the applicant addressed the loss of section thickness due to erosion that could occur in SG feedwater impingement plates and supports.

Section 3.1.2.2.10 of the SRP-LR states that the loss of section thickness due to erosion could occur at the feedwater impingement plates and supports in the SGs. The GALL Report recommends further evaluation of the effectiveness of the applicant's plant-specific AMP to ensure that this aging effect is adequately managed.

The applicant stated that its SGs have a recirculating feedring design that includes an elevated feedring and feedwater spargers. The SGs do not use impingement plates. Therefore, the loss of section thickness due to erosion of the feedwater impingement plates and supports is not applicable to FNP.

3.1.2.2.11 Crack Initiation and Growth Due to PWSCC, ODSCC, or Intergranular Attack or Loss of Material Due to Wastage and Pitting Corrosion or Loss of Section Thickness Due to Fretting and Wear or Denting Due to Corrosion of Carbon Steel Tube Support Plates

In Section 3.1.2.2.11 of the LRA, the applicant addressed crack initiation and growth due to PWSCC, outside-diameter stress-corrosion cracking (ODSCC), or intergranular attack (IGA) or loss of material due to wastage and pitting corrosion or deformation due to corrosion that could occur in nickel-based (NiCrFe) alloy components of the SG tubes and plugs.

Section 3.1.2.11 of the SRP-LR states that crack initiation and growth due to PWSCC, ODSCC, or IGA or loss of material due to wastage and pitting corrosion or deformation due to corrosion could occur in Alloy 600 components of the SG tubes, repair sleeves, and plugs. All PWR licensees have committed voluntarily to an SG degradation management program described in NEI 97-06; the NRC staff is currently reviewing these guidelines. The GALL Report recommends development of an AMP based on the recommendations of staff-approved NEI 97-06 guidelines, or another alternate regulatory basis for SG degradation management, to ensure that this aging effect is adequately managed.

To manage the effects of aging, the applicant credited the Steam Generator Program (AMP B.3.8) and the Water Chemistry Control Program (AMP B.3.2). The applicant stated that its Steam Generator Program is based on the recommendations of staff-approved NEI 97-06 guidelines and is consistent with GALL Report AMP XI.M19, “Steam Generator Tube Integrity.” Sections 3.0.3.1 and 3.0.3.2.1 of this SER document the staff’s evaluation of these programs.

In Section 3.1.2.2.11 of the LRA, the applicant stated that it does not consider degradation of the replacement SG thermally treated Alloy 690 tubes likely based on the improved materials of construction and design of the replacement Model 54F SGs, but the applicant conservatively considered such degradation in the AMR results. The applicant has not installed SG tube sleeves and plugs in the replacement SGs. However, the applicant will use thermally treated Alloy 690 should it install any plugs or sleeves. The loss of material due to pitting and wastage related to phosphate chemistry does not apply because the applicant has not utilized phosphate chemistry. However, the applicant conservatively considered localized corrosion of the thermally treated Alloy 690 SG tubes in the AMR results. The replacement SGs employ stainless steel tube support plates and flow distribution baffles. As such, denting of tubes at support plate intersections is unlikely to occur. However, the applicant conservatively considered the potential for denting in the AMR results.

Based on the low likelihood of these aging effects, and because the applicant has conservatively considered these aging effects in the AMR evaluation, the staff concluded that the Steam Generator Program and the Water Chemistry Control Program will effectively manage SG tube degradation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving the management of (1) crack initiation and growth due to PWSCC, ODSCC, and/or IGA, (2) loss of material due to wastage and pitting corrosion, (3) loss of material due to fretting and wear, or (4) denting due to corrosion of carbon steel tube support plate in the SG tubes and plugs, as recommended in the GALL Report. Since the applicant’s AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that these 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).

3.1.2.2.12 Loss of Section Thickness Due to Flow-Accelerated Corrosion

In Section 3.1.2.2.12 of the LRA, the applicant addressed the loss of section thickness due to FAC that could occur in SG tube support lattice bars made of carbon steel.

Section 3.1.2.2.12 of the SRP-LR states that the loss of section thickness due to FAC could occur in tube support lattice bars made of carbon steel. The GALL Report recommends evaluation of a plant-specific AMP and, on the basis of the guidelines of NRC GL 97-06, development of an inspection program for SG internals to ensure that this aging effect is adequately managed.

The applicant stated that this aging effect applies only to CE SGs and that its Westinghouse Model 54F replacement SGs do not use lattice bars. In addition, the tube support plates are fabricated from FAC-resistant stainless steel. Therefore, this aging effect does not apply to FNP.

On the basis that the applicant's SG design does not include carbon steel tube support lattice bars, the staff concludes that this aging effect does not apply to FNP.

3.1.2.2.13 Ligament Cracking Due to Corrosion

In Section 3.1.2.2.13 of the LRA, the applicant addressed the ligament cracking due to corrosion that could occur in carbon steel components in the SG tube support plate.

Section 3.1.2.2.13 of the SRP-LR states that ligament cracking due to corrosion could occur in carbon steel components in the SG tube support plate. All PWR licensees have committed voluntarily to an SG degradation management program described in NEI 97-06; the staff is currently reviewing these guidelines. The GALL Report recommends development of an AMP based on the recommendations of staff-approved NEI 97-06 guidelines or other alternate regulatory basis for SG degradation management to ensure that this aging effect is adequately managed.

The applicant stated that its SG tube support plates are fabricated from stainless steel; therefore, this degradation mode does not apply.

Because the SG design does not include carbon steel tube support plates, the staff concludes that this aging effect does not apply to FNP.

3.1.2.2.14 Loss of Material Due to Flow-Accelerated Corrosion (PWR)

In Section 3.1.2.2.14 of the LRA, the applicant addressed the loss of material due to FAC that could occur in feedwater inlet rings and supports.

Section 3.1.2.2.14 of the SRP-LR states that the loss of material due to FAC could occur in feedwater inlet rings and supports. As noted in CE IN 90-04, NRC IN 91-19, and Licensee Event Report 50-362/90-05-01, this form of degradation has been detected only in certain CE System 80 SGs. The GALL Report recommends further evaluation to ensure that this aging effect is adequately managed. The GALL Report also recommends evaluation of a plant-specific AMP because existing programs may not be capable of mitigating or detecting the loss of material due to FAC.

The applicant stated that its replacement SGs are of Westinghouse Model 54F design, for which this form of degradation has not been detected. Therefore, the components are not subject to this aging effect.

On the basis that the applicant's replacement SGs are of Westinghouse design, and that the loss of material due to FAC has been detected only in certain CE System 80 SGs, the staff concludes that this aging effect does not apply to FNP.

Conclusion

On the basis of its audit and review, the staff finds that the applicant's further evaluations conducted in accordance with the GALL Report are consistent with the acceptance criteria in Section 3.1.2.2 of the SRP-LR. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

3.1.2.3.1 Reactor Vessel Aging Management Review Results

3.1.2.3.1.1 Summary of Technical Information in the Application

In Section 3.1.2.1.1 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the AERMs for the RPV and associated pressure boundary components:

- Water Chemistry Control Program
- Inservice Inspection Program
- Reactor Vessel Surveillance Program
- NiCrFe Component Assessment Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.1.2-1 of the LRA, the applicant provided a summary of AMRs for the RPV and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

3.1.2.3.1.2 Staff Evaluation

Loss of Material in Austenitic Stainless Steel or Nickel-Based Alloy RV Components Under Exposure to the Borated Water Environment

Summary of Technical Information in the Application

The applicant identified that loss of material is an applicable aging effect for NiCrFe components and stainless steel RV components that are exposed to borated water environments. It categorized its AMR for these components as one for which the GALL Report has not identified the aging effect for the material-environment conditions for the components (i.e., note H to Table 3.1.2-1). The scope of this commodity group includes the following components:

- bottom head torus and dome (low-alloy steel with stainless steel cladding)

- BMI guide tubes (stainless steel)

- BMI penetrations (Alloy 600)
- core exit thermocouple (CET) and heated junction thermocouple closure (HJTC) assemblies (stainless steel)
- closure head dome and flange (low-alloy steel with stainless steel cladding)
- RV core support lugs (Alloy 600)
- CRDM and instrumentation housing penetration nozzles (thermally treated Alloy 690)
- CRDM housing flange adapters (stainless steel)
- CRDM latch housings and rod travel housings (stainless steel)
- RV head vent penetration (thermally treated Alloy 690)
- intermediate and lower shell courses (low-alloy steel with stainless steel cladding)
- RV leakage monitoring tube assembly (Alloy 600)
- RV primary nozzle safe end (stainless steel with Alloy 82/182 welds and buttering)
- vessel flange (low-alloy steel with stainless steel cladding)
- seal table and fittings (stainless steel)
- upper (nozzle) shell course (low-alloy steel with stainless steel cladding)
- stainless steel cladding for the low-alloy steel or carbon steel RV components that are clad with austenitic stainless steel

The applicant credited the Water Chemistry Program with the management of loss of material in these components.

Identification of Aging Effects

The applicant identified that loss of material is an applicable aging effect for NiCrFe components and stainless steel RV components that are exposed to borated water environments. These components include carbon steel or low-alloy steel components that are clad with austenitic stainless steel that is exposed to the borated water environments.

The applicant did not identify in Section 3.1 of the LRA or in LRA Table 3.1.2-1 which aging mechanisms it considered capable of inducing loss of material in the stainless steel (including stainless steel clad components) or NiCrFe RV components exposed to borated water. The staff required additional information on this matter. Specifically, for each of these components, the staff requested that the applicant define which aging mechanism or mechanisms were considered to be capable of inducing loss of material in the components. The staff identified this as RAI 3.1.3.1.1-1, Part a. The staff also informed the applicant that this RAI also applies to comparable NiCrFe and stainless steel RV internals components within the scope of Table 3.1.2-2 and comparable NiCrFe and stainless steel piping and pressurizer components within the scope of Table 3.1.2-3. Part a of RAI 3.1.3.1.1-1 applies to the following RV components:

- bottom head torus and dome (low-alloy steel with stainless steel cladding)
- BMI guide tubes (stainless steel)
- BMI penetrations (Alloy 600)
- CET and HJTC assemblies (stainless steel)
- closure head dome and flange (low-alloy steel with stainless steel cladding)
- RV core support lugs (Alloy 600)
- CRDM and instrumentation housing penetration nozzles (thermally treated Alloy 690)
- CRDM housing flange adapters (stainless steel)
- CRDM latch housings and rod travel housings (stainless steel)
- RV head vent penetration (thermally treated Alloy 690)
- intermediate and lower shell courses (low-alloy steel with stainless steel cladding)
- RV leakage monitoring tube assembly (Alloy 600)
- RV primary nozzle safe end (stainless steel with Alloy 82/182 welds and buttering)
- vessel flange (low-alloy steel with stainless steel cladding)
- seal table and fittings (stainless steel)
- upper (nozzle) shell course (low-alloy steel with stainless steel cladding)
- stainless steel cladding for the low-alloy steel or carbon steel RV components that are clad with austenitic stainless steel

The applicant provided its response to RAI 3.1.3.1.1-1, Part a, in SNC Letter No. NL-04-0617, dated April 16, 2004. In its response to the RAI, the applicant confirmed that loss of material was an applicable aging effect for all the stainless steel and NiCrFe RV components identified in RAI 3.1.3.1.1-1, Part a, and that for all of these components, loss of material due to crevice corrosion or pitting corrosion was an applicable aging effect/mechanism requiring management.

The applicant also indicated that it conservatively assumed that loss of material due to wear was an applicable aging effect/mechanism requiring management for the RV flange.

The staff concludes that the applicant's response to RAI 3.1.3.1.1-1, Part a, is acceptable because it clarifies which aging mechanisms could induce loss of material for those stainless steel or NiCrFe RV components identified in LRA Tables 3.1.2-1, 3.1.2-2, and 3.1.2-3 as exposed to borated water. Therefore, RAI 3.1.3.1.1-1, Part a, is resolved. Section 3.1.2.3.3, in the subsection entitled "Aging Management Programs or Activities Credited with Aging Management," provides the staff's assessment of the AMPs credited for managing loss of material in these components.

Aging Management Programs

With the exception of the vessel flange (a low-alloy steel component with internal stainless steel cladding), the applicant has credited the Water Chemistry Control Program for the management of the loss of material that may occur in the NiCrFe and stainless steel RV components (including low-alloy steel or carbon steel components with stainless steel cladding or inserts) that are exposed to the borated water environment.

The applicant credited both the Inservice Inspection Program and Water Chemistry Control Program with the management of the loss of material from the internal stainless steel cladding surfaces of the RV flange. The applicant's Inservice Inspection Program is an established AMP that is based on compliance with the staff's ISI requirements in 10 CFR 50.55a. This program has appropriate requirements for inspecting the stainless steel cladding surfaces of the RV flange and is acceptable for inspections of the RV flange and its cladding. Section 3.0.3.1 of this SER provides the staff's evaluation of the ability of the Inservice Inspection Program to manage wear in the RV flange and its cladding. As a supplement to the Inservice Inspection Program, the applicant credited the Water Chemistry Control Program as an additional mitigative AMP, as recommended for aging management in the AMR for GALL commodity group IV.A2.5-f. Therefore, the applicant's approach is acceptable. Section 3.0.3.2.1 of this SER provides the staff's evaluation of the Water Chemistry Control Program.

For other stainless steel or NiCrFe RV components, the staff informed the applicant that AMPs designed to manage the loss of material depend upon the type of aging mechanism that leads to the aging effect and that the applicant's Water Chemistry Control Program was not an inspection-based AMP. Instead, the staff noted that water chemistry programs are based on mitigative strategies that should reduce the probability that aging effects related to the loss of material or cracking will occur as a result of aging mechanisms related to chemical reactions or corrosion. Therefore, the staff requested that the applicant provide its technical bases for considering only the Water Chemistry Control Program to be sufficient to manage loss of material in the components without including an inspection-based AMP to confirm that the Water Chemistry Program is accomplishing its mitigative function. As an alternative, the staff requested that the applicant propose an acceptable inspection-based AMP to manage the loss of material in the specific RV components within the scope of RAI 3.1.3.1.1-1, Part a. The staff identified this issue as RAI 3.1.3.1.1-1, Part b.

The applicant provided the following response to RAI 3.1.3.1.1-1, Part b, in SNC Letter No. NL-04-0617, dated April 16, 2004:

> In the LRA, the FNP Water Chemistry Control Program (alone) is credited to manage loss of material due to the aging mechanisms of crevice corrosion and pitting for all of the components listed by RAI 3.1.3.1.1-1a. Our rationale follows.

> The wetted surfaces (borated water environment) of the components identified in 3.1.3.1.1-1 are fabricated from stainless steel and NiCrFe alloys. For stainless steels and NiCrFe alloys, penetration of the passive chromium oxide layer and subsequent corrosion has been shown to be principally related to the oxidizing nature of the environment and the presence of specific detrimental ionic species known to interfere with the passivation process; most notably chlorides, sulfates, and fluorides.
>
> The FNP Water Chemistry Control Program is implemented consistent with the EPRI Primary Water Chemistry Guidelines. This industry guideline is the result of extensive industry operating experience, research, and industry consensus. The resulting program provides for both a strongly reducing coolant environment via the addition of oxygen scavengers such as hydrogen and for strict control of ionic species. A sufficient residual concentration of hydrogen is maintained at all times to assure the reducing nature of the reactor coolant. Detrimental ionic species such as chlorides, sulfates, and fluorides are limited to the low ppb range during power operations.
>
> FNP and industry wide operating experience confirm that pitting and crevice corrosion has not been an issue of concern for reactor coolant system components. FNP inservice inspections performed in accordance with Section XI of the ASME Code include numerous inspection locations consisting of the borated water environment and stainless steel and NiCrFe alloy material combinations.
>
> The aging effects determinations in NUREG-1801 also support this position. NUREG-1801 acknowledges that loss of material due to pitting and crevice corrosion is not an aging effect/mechanism requiring management for stainless steel components exposed to a borated water environment. Specifically, several sections of NUREG-1801 (e.g., sections V.D1, VII.A3, VII.E1) include a conclusive statement that stainless steel components are not subject to significant general, pitting, and crevice corrosion in a borated water environment; therefore these aging mechanisms are not included in NUREG-1801 for this material and environment combination. In addition, SNC has not identified any NUREG-1801 recommendation for an inspection-based AMP to manage loss of material due to pitting and crevice corrosion for stainless steel and NiCrFe alloys in a borated water environment.

Pitting corrosion and crevice corrosion may occur in ASME Code, Class 1, stainless steel or NiCrFe components under exposure to aggressive, oxidizing environments. Normally, the presence of elevated dissolved oxygen and/or aggressive ionic impurity concentrations is necessary to create these oxidizing environments in the RCS. The applicant's response to RAI 3.1.3.1.1-1, Part b, provides an acceptable explanation for citing the Water Chemistry Control Program as a basis for minimizing the dissolved oxygen and ionic impurity concentrations that could otherwise, if left present in high concentrations, lead to an aggressive, oxidizing RCS coolant environment. The GALL Report does not indicate that the loss of material due to pitting corrosion or crevice corrosion is an aging effect of concern for stainless steel or NiCrFe ASME Code Class 1 components. Since the applicant has conservatively assumed that the loss of material due to pitting corrosion or crevice corrosion is an applicable aging effect for these RV components, the staff concludes that the Water Chemistry Control Program provides a sufficient mitigative strategy for managing this aging effect relative to the recommendations of the GALL Report. Section 3.0.3.2.1 of this SER provides the staff's evaluation of the Water Chemistry Control Program.

In its response to RAI 3.1.3.1.1-1, Part a, the applicant also confirmed that the RV flange was the only alloy steel/stainless steel clad component in the RV that could potentially be subject to loss of material due to wear as a result of exposure of the stainless steel cladding to the borated water environment. Earlier in this section, the staff discussed, evaluated, and accepted the applicant's basis and proposed AMPs for managing wear in the RV flange. In addition to the RV flange, Section IV.A2 of GALL, Volume 2 (i.e., in GALL commodity group IV.A2.2-f), also identifies that the stainless bolting in bolted CRDM housing flange designs may be susceptible to loss of material as a result of wear. However, this commodity group does not apply to the CRDM housing flange adapters in the FNP designs because the CRDM housing flange adapters do not involve bolted configurations.

Based on its review of the contents of LRA Table 3.1.2-1, and SNC's responses to RAI 3.1.3.1.1-1, Parts a and b, the staff concludes that the applicant has proposed acceptable AMPs for managing the loss of material as a result of crevice corrosion, pitting corrosion, and wear in the stainless steel and NiCrFe RV components. Therefore, RAI 3.1.3.1.1-1, Part b, is resolved.

The staff has reviewed the applicant's AMRs for evaluating the loss of material in ASME Code, Class 1, RV components that are made from stainless steel or NiCrFe materials and are exposed to borated water. The staff concludes that the applicant has credited an acceptable basis for concluding that its Water Chemistry Control Program is sufficient to manage the loss of material in these components as a result of pitting corrosion or crevice corrosion. The staff has also determined that the applicant has credited an acceptable inspection-based AMP (i.e., the Inservice Inspection Program) to manage the loss of material in the RV flange as a result of wear.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Loss of Material in Low-Alloy Steel or Carbon Steel RV Components That Are Exposed Externally to Inside (Atmospheric) Environments</u>

Summary of Technical Information in the Application

The applicant identified that loss of material is an AERM for low-alloy steel and carbon steel components that are exposed externally to the inside (atmospheric) environment. The scope of this commodity group includes the following components:

- bottom head torus and dome (low-alloy steel with stainless steel cladding)
- closure head dome and flange (low-alloy steel with stainless steel cladding)
- RV closure studs, nuts, and washers (low-alloy steel)
- intermediate and lower shell courses (low-alloy steel with stainless steel cladding)
- primary inlet and outlet nozzles and nozzle support pads (low-alloy steel with stainless steel cladding)
- refueling seal ledge (carbon steel)
- vessel flange (low-alloy steel with stainless steel cladding)

- upper (nozzle) shell course (low-alloy steel with stainless steel cladding)
- ventilation shroud support ring (carbon steel)

The applicant credits the Borated Water Leakage Assessment and Evaluation Program with the management of loss of material in these low-alloy steel or carbon steel components.

Identification of Aging Effects

The applicant identified that loss of material is an applicable aging effect for the low-alloy steel and carbon steel RV components that are exposed to the inside environment, and it credited the Borated Water Leakage Assessment and Evaluation Program with management of this aging effect. The applicant did not identify which aging mechanisms could lead to the loss of material in the RV components that are fabricated from low-alloy steel or carbon steel, although the AMP credited with aging management appears to imply that the applicant only considered potential leakage of the borated coolant as a mechanism that could induce loss of material from the external surfaces of these components. Low-alloy steel and carbon steel components may also be susceptible to general corrosion in atmospheric environments if the atmospheres are damp, moist, or humid.

The applicant described the inside environment in Section 3.0.4 and Table 3.0.4-2 of the FNP LRA. In the table, the applicant provided the following definition for the inside environment:

> The environment [is] found within environmentally controlled structures. As a minimum, temperature is controlled to prevent freezing. This environment includes the Containment Building, Auxiliary Building, EDG Building, and Service Water Intake Structure.
>
> Within containment, the average bulk temperature is 120 °F, with 5%–95% humidity, and up to 1 RAD per hour dose rates. The air temperature varies throughout the Containment according to location and elevation. Some areas of the containment (e.g., hot pipe penetrations) may be subject to elevated localized temperatures.
>
> Components located in the area of systems containing borated water may be subject to borated water leakage.

The description of the inside environment in the FNP LRA did not indicate if the applicant managed the water vapor content in the inside environment to low humidity levels. Therefore, the staff asked the applicant to clarify whether the loss of material due to general corrosion was an applicable aging effect for external surfaces of low-alloy steel or carbon steel RV components that are exposed to the inside environment and, if not, to justify the exclusion of general corrosion from management during the period of extended operation. The staff identified this issue as RAI 3.1.3.1.2-1, Part a, and informed the applicant that the scope of the RAI applied to the following RV components:

- bottom head torus and dome (low-alloy steel with stainless steel cladding)
- closure head dome and flange (low-alloy steel with stainless steel cladding)
- RV closure studs, nuts, and washers (low-alloy steel)
- intermediate and lower shell courses (low-alloy steel with stainless steel cladding)

- primary inlet and outlet nozzles and nozzle support pads (low-alloy steel with stainless steel cladding)

- refueling seal ledge (carbon steel)

- RV flange (low-alloy steel with stainless steel cladding)

- upper (nozzle) shell course (low-alloy steel with stainless steel cladding)

- ventilation shroud support ring (carbon steel)

As discussed in Section 3.0.3.1 of this SER, industry experience has demonstrated that the loss of material due to boric acid corrosion and boric acid-induced wastage may occur on the external surfaces of ASME Code, Class 1, low-alloy steel and carbon steel components as a result of exposure to potential leaks to the reactor coolant (i.e., leaks of the borated water). Based on this analysis, the staff concludes that the applicant's assertion that the loss of material due to boric acid corrosion applies to the external surfaces of the low-alloy steel and carbon steel RV components is acceptable.

The applicant provided its response to RAI 3.1.3.1.2-1, Part a, in SNC Letter No. NL-04-0617, dated April 16, 2004. In this response, the applicant confirmed that it identified the loss of material due to boric acid corrosion as an applicable aging effect for the surfaces of carbon steel or low-alloy steel RV components that are exposed to the inside air environments and could potentially be exposed to leakage of the borated reactor coolant. This is consistent with the corresponding AMRs in GALL, Volume 2; therefore, this reasoning is acceptable.

The applicant also stated that it did not consider the loss of material due to general corrosion to be an applicable aging effect for these components in the inside environment because the continued presence of moisture is required to sustain significant general corrosion of carbon steel and low-alloy steel components. Instead, these components operate at temperatures well above 212 °F. The applicant clarified that since the exterior surface temperatures of the components significantly exceed the ambient temperature, condensation is not expected to occur on the external surfaces, and the high surface temperatures would evaporate any moisture or leakage. The staff concurs that this is an acceptable basis for concluding that general corrosion is not a concern because the operating temperatures for the components should preclude the occurrence of any precipitation that might otherwise induce general corrosion in the components. Therefore, RAI 3.1.3.1.2-1, Part a, is resolved.

The applicant indicated that the RV closure studs, nuts, and washers are the only carbon steel or low-alloy steel RV components in the inside environment that could potentially be subject to loss of material as a result of wear. This conclusion is consistent with GALL Volume 2, Section IV.A2. The corresponding AMR in GALL, Volume 2, is commodity group entry IV.A2.1-d. Based on this assessment, the staff concludes that the applicant's evaluation of wear in the carbon steel and low-alloy steel RV components is acceptable because it is consistent with those AMR commodity groups in GALL that identify wear as an applicable effect for carbon steel or alloy steel RV components in air-based environments.

Aging Management Programs

The applicant credited the Borated Water Leakage Assessment and Evaluation Program with the management of the loss of material from the external surfaces of the low-alloy steel or carbon steel RV components that are exposed to the inside environment. Crediting this AMP for aging management implies that loss of material is possible only from the external surfaces of low-alloy steel and carbon steel RV components if through-wall leakage of the borated coolant occurs in the components. In RAI 3.1.3.1.2-1, Part a, the staff requested additional information regarding the aging mechanisms that could induce the loss of material from the external surfaces of low-alloy steel and carbon steel RV, RCS piping, and pressurizer components under exposure to inside environments. The staff therefore asked the applicant to provide its technical basis for concluding that only the Borated Water Leakage Assessment and Evaluation Program will be necessary to manage the loss of material in external surfaces of low-alloy steel and carbon steel RV components, particularly if aging mechanisms other than the boric acid-leakage and boric acid-induced waste are known to induce the loss of material aging effect. The staff identified this issue as RAI 3.1.3.1.2-1, Part b, and informed the applicant that this RAI also applied to the evaluation of the loss of material from the external surfaces of low-alloy steel or carbon steel RCS piping or pressurizer components.

In its review of the applicant's response to Part a of RAI 3.1.3.1.2-1, dated April 16, 2004, the staff concurred with the applicant that the loss of material due to general corrosion was not an AERM for the external surfaces of ASME Code, Class 1, carbon steel or low-alloy steel RV components because of the high operating temperatures of the components and the conclusion that precipitation on the external surfaces was unlikely. In its response to Part b of RAI 3.1.3.1.2, dated April 16, 2004, the applicant indicated that an AMP is not necessary for managing general corrosion in these components because general corrosion is not identified as an applicable aging effect for the components. Based on the staff's review of the applicant's response to RAI 3.1.3.1.2-1, Part a, and concurrence that general corrosion is not an aging effect of concern for the external surfaces of carbon steel/low-alloy steel RV components, the staff agrees that an AMP is not necessary to manage general corrosion in the external surfaces of carbon steel or low-alloy steel RV components. Therefore, RAI 3.1.3.1.2, Part b, is resolved. As discussed in Sections 3.0.3.1 and 3.0.3.1.1 of this SER, industry experience has demonstrated that the loss of material due to boric acid leakage and boric acid-induced wastage (i.e., boric acid-induced corrosion) may occur on the external surfaces of ASME Code, Class 1, low-alloy steel and carbon steel components that could potentially be exposed to leaks to the reactor coolant (i.e., leaks of the borated water). The staff issued GL 88-05 to address the impacts of this issue on the PWR industry. Based on this operating experience, Section IV of GALL, Volume 2, identifies that loss of material due to boric acid corrosion is an AERM for external surfaces of carbon steel and low-alloy steel components. The staff concludes that crediting the Borated Water Leakage Assessment and Evaluation Program with the management of the loss of material due to boric acid leakage and wastage for the surfaces of low-alloy steel or carbon steel RV components that are exposed to the inside environment is acceptable because it is consistent with GALL, Volume 2, and industry experience. Sections 3.0.3.1 and 3.0.3.1.1 of this SER provide the staff's evaluation of the Borated Water Leakage Assessment and Evaluation Program.

The applicant credited its Inservice Inspection Program with managing the loss of material on RV closure studs, nuts, and washers as a result of wear. GALL commodity group IV.A2.1-d recommends use of a bolting integrity program for the management of wear in these closure stud assembly components. Instead, the applicant uses the bolting requirements of ASME Code, Section XI, Inspection Category B-G-1 as the basis for examining these once every inspection interval. This inspection category is invoked by the requirements of 10 CFR 50.55a. The staff finds this to be an acceptable alternative to a bolting integrity program because the inspections will be done in accordance with applicable NRC ISI requirements for the RV closure stud assembly components. The staff evaluates the Inservice Inspection Program in Section 3.0.3.1 of this SER.

The staff has reviewed the applicant's AMRs for evaluating loss of material in Class 1 RV components that are made from carbon steel or low-alloy steel materials and that are exposed to the inside environment. The staff concludes that the applicant has provided an acceptable technical basis for concluding that the loss of material due to general corrosion is not an applicable AERM for the external component surfaces that are exposed to the inside environment. The staff also concludes that the applicant has credited an acceptable AMP for managing the loss of material from the external surfaces of carbon steel or low-alloy steel RV components that could be potentially exposed to borated reactor coolant. The staff concludes that the applicant has also credited an acceptable inspection-based AMP to manage loss of material in the RV closure studs, nuts, and washers as a result of wear.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Aging Effects That Are Applicable to NiCrFe or Stainless Steel RV Components That Are Exposed Externally to Inside (Atmospheric) Environments</u>

Summary of Technical Information in the Application

In Table 3.1.2-1 of the LRA, the applicant provided its AMRs for evaluating the effects of aging that apply to NiCrFe and stainless steel RV components that are exposed externally to the inside (atmospheric) environment. With the exception of the AMR for evaluating the loss of material in the CET bolts and the HJTC assembly bolts, the applicant concluded in these AMRs that exposure of the external surfaces of the NiCrFe and stainless steel RV components to the inside environment will not result in any aging effects that require management during the period of extended operation for the FNP units.

In its corresponding AMRs for evaluating aging in the stainless CET bolts and HJTC assembly bolts, the applicant concluded that cracking and loss of material are both aging effects that require aging management for the period of extended operation for the FNP units. The applicant designated these AMRs as note E items in the table.

The scope of this commodity group assessment includes the following components:

- BMI guide tubes (stainless steel)
- BMI penetrations (Alloy 600)
- CET and HJTC assemblies (stainless steel)
- CRDM and instrumentation housing penetration nozzles (thermally treated Alloy 690)
- CRDM housing flange adapters (stainless steel)

- CRDM latch housings and rod travel housings (stainless steel)
- RV head vent penetration (thermally treated Alloy 690)
- RV leakage monitoring tube assembly (Alloy 600)
- RV primary nozzle safe end (stainless steel with Alloy 82/182 welds and buttering)
- seal table and fittings (stainless steel)

Identification of Aging Effects

In Section 3.1.2.1 of this SER, the staff evaluated the applicant's AMRs for aging effects in the CET bolts and HJTC assembly bolts under exposure to the inside environment.

With the exception of the applicant's AMRs for evaluating aging that may apply to the stainless steel CET bolts and stainless steel HJTC assembly bolts, the applicant concluded that there are no aging effects that require aging management for the external of NiCrFe and stainless steel RV components that are exposed externally to the inside environment. Nonbolted ASME Code, Class 1, NiCrFe and stainless steel materials are designed to resist corrosion-based mechanisms that may induce corrosion-induced cracking or loss of material under exposure to moist, damp, or wet air environments. The staff therefore concurs that, with the exception of the management of cracking and loss of material that may occur in the CET bolts and HJTC bolts under exposure to the inside environment, loss of material and cracking are not aging effects that require management for the surfaces of nonbolted NiCrFe and stainless ASME Code Class 1 components that are exposed to the inside environment.

In Table 3.1.2-1 of the LRA, the applicant concluded that cracking and loss of material are both aging effects that require management for the CET bolts and HJTC assembly bolts under exposure to the inside environment. Section 3.1.2.1 of this SER provides the staff's evaluation of the applicant's AMRs for aging effects in the CET bolts and HJTC assembly bolts under exposure to the inside environment.

Aging Management Programs

The applicant did not credit any AMPs for the management of the loss of material or cracking in the surfaces of nonbolted ASME Code, Class 1, NiCrFe and stainless steel components under exposure to the inside environment. Since these components are designed to resist corrosion under exposure to air environments, the staff concurs that aging management is not necessary for the surfaces of these components that are exposed to the inside environment.

In Table 3.1.2-1 of the LRA, the applicant credited the Inservice Inspection Program for the management of cracking and loss of material that may occur in the CET bolts and HJTC assembly bolts under exposure to the inside environment. Section 3.1.2.1 of this SER provides the staff's evaluation of the ability of the Inservice Inspection Program to manage the loss of material and cracking in the CET bolts and HJTC assembly bolts.

The staff has reviewed the applicant's AMRs for evaluating whether loss of material is an AERM for the surfaces of nonbolted ASME Code, Class 1, NiCrFe and stainless steel components under exposure to the inside environment. The staff has determined that the applicant provided an acceptable basis for concluding that loss of material is not an AERM for the external surfaces of nonbolted ASME Code, Class 1, NiCrFe and stainless steel components that are exposed to the inside environment.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the reactor vessel, internals, and RCS SSCs with the environments described in Tables 3.1.2-1 through 3.1.2-4 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects that are appropriate for the material-environment combinations listed.\

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.2 Reactor Vessel Internals Aging Management Review Results

3.1.2.3.2.1 Summary of Technical Information in the Application

In Section 3.1.2.1.2 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that handle the AERMs for the reactor vessel internals components:

- Water Chemistry Control Program
- Inservice Inspection Program
- Reactor Vessel Internals Program
- Flux Detector Thimble Inspection Program

In Table 3.1.2-2 of the LRA, the applicant summarized the AMRs for the reactor vessel internals components and identified which AMRs it considered to be consistent with the GALL Report.

3.1.2.3.2.2 Staff Evaluation

Loss of Material in Austenitic Stainless Steel or Nickel-Based Alloy RV Internal Components Under Exposure to the Borated Water Environment

Summary of Technical Information in the Application

The applicant identified that loss of material is an AERM for nickel-based (NiCrFe) alloy and austenitic stainless steel RV internal components that are exposed to borated water environments. In Table 3.1.2-2 of the LRA, the applicant designated these AMRs as note H items. The scope of this commodity group includes the following components:

- baffle/former plates (stainless steel)

- baffle bolts (stainless steel)

- BMI column cruciforms (CASS)

- BMI columns with associated fasteners (stainless steel)

- clevis inserts and fasteners (NiCrFe alloys—Alloy 600 for the inserts and Alloy X-750 for the fasteners)
- control rod guide tube (CRGT) assemblies with associated fasteners (stainless steel)
- core barrel and core barrel flange (stainless steel)
- core barrel outlet nozzles (stainless steel)
- CRGT support pins (stainless steel)
- flux thimble tubes (stainless steel)
- head/RV alignment pins with associated fasteners (stainless steel)
- head cooling spray nozzles (stainless steel)
- HJTC probe holder, probe holder extension, and probe holder shroud assemblies with associated fasteners (stainless steel)
- internals holddown spring (stainless steel)
- lower core plate and fuel alignment pins with associated fasteners (stainless steel)
- lower support columns with associated fasteners (stainless steel)
- lower support forging (stainless steel)
- neutron panels with associated fasteners (stainless steel)
- radial support keys and fasteners (stainless steel)
- secondary core support assembly with associated fasteners (stainless steel)
- upper core plate alignment pins with associated fasteners (stainless steel)
- upper core plate and the fuel alignment pins with associated fasteners (stainless steel)
- upper instrumentation conduit and supports with associated fasteners (stainless steel)
- upper support assembly with associated fasteners (stainless steel)
- upper support column bases (CASS)
- upper support columns with associated fasteners (stainless steel)

Identification of Aging Effects

The applicant identified that loss of material is an applicable aging effect for NiCrFe components and stainless steel RV internal components that are exposed to borated water environments. It categorized its AMR for these components as one for which the GALL Report did not identify an aging effect for the material-environment combinations for the components (i.e., note H designation in Table 3.1.2-2). These components include CASS RV internal components that are exposed to the borated water environments.

The applicant did not identify in Section 3.1 of the LRA or in LRA Table 3.1-2-1 which aging mechanisms could lead to the loss of material in these commodity group components. In SER Section 3.1.3.1.1, the staff evaluated the validity of applicant's identification of the aging mechanisms that could induce a loss of material in NiCrFe and stainless steel RV components. In RAI 3.1.3.1.1-1, Part a, the staff requested that the applicant identify all aging mechanisms that could lead to the loss of material in NiCrFe and stainless steel RV, RV internal, RCS piping, and pressurizer components that are exposed to borated water. The staff identified the following NiCrFe and stainless steel RV internal components as within the scope of RAI 3.1.3.1.1-1, Part a:

- baffle/former plates (stainless steel)
- baffle bolts (stainless steel)
- BMI column cruciforms (CASS)
- BMI columns with fasteners (stainless steel)
- clevis inserts and fasteners (NiCrFe alloy—Alloy 600 inserts and Alloy X-750 fasteners)
- CRGT assemblies with associated fasteners (stainless steel)
- core barrel and core barrel flange (stainless steel)
- core barrel outlet nozzles (stainless steel)
- CRGT support pins (stainless steel)
- flux thimble tubes (stainless steel)
- RPV/head alignment pins with associated fasteners (stainless steel)
- head cooling spray nozzles (stainless steel)
- HJTC probe holder, probe holder extension, and probe holder shroud assemblies with associated fasteners (stainless steel)
- internals holddown spring (stainless steel)
- lower core plate and fuel alignment pins (stainless steel)
- lower support columns with associated fasteners (stainless steel)

- lower support forging (stainless steel)
- neutron panels (stainless steel)
- radial keys and fasteners (stainless steel)
- secondary core support assembly with associated fasteners (stainless steel)
- upper core alignment pins with associated fasteners (stainless steel)
- upper core plate and fuel alignment pins with associated fasteners (stainless steel)
- upper instrumentation conduit and supports with associated fasteners (stainless steel)
- upper support assembly with associated fasteners (stainless steel)
- upper support column bases (stainless steel)
- upper support column with associated fasteners (stainless steel)

The applicant provided its response to RAI 3.1.3.1.1-1, Part a, in SNC Letter No. NL-04-0617, dated April 16, 2004. In its response to the RAI, the applicant confirmed that loss of material was an applicable aging effect for all the stainless steel and NiCrFe RV internal components identified in RAI 3.1.3.1.1-1, Part a, and that for all of these components, the loss of material due to crevice corrosion or pitting corrosion was an applicable aging effect/mechanism requiring management. The applicant also confirmed that it conservatively assumed that the loss of material due to wear was an applicable aging effect/mechanism requiring management for the RV internals upper core plate alignment pins, holddown spring, clevis inserts and fasteners, radial support keys and fasteners, and flux detector thimble tubes.

The staff concludes that the applicant's response to RAI 3.1.3.1.1-1, Part a, is acceptable because it clarifies which aging mechanisms could induce a loss of material for the stainless steel or NiCrFe RV internal components that LRA Table 3.1.2-2 identified as exposed to borated water. Therefore, RAI 3.1.3.1.1-1, Part a, is resolved. Section 3.1.2.3.3, in the subsection entitled, "Aging Management Programs or Activities Credited with Aging Management," provides the staff's assessment of the AMPs credited for managing loss of material in these components.

Aging Management Programs

With the exception of AMRs in LRA Table 3.1.2-2 for managing the loss of material in the in-core flux thimble tubes, internals holddown spring, clevis inserts and fasteners, upper core plate alignment pins, and the radial support keys and fasteners, the applicant credited the Water Chemistry Control Program as the AMP for managing the loss of material that may occur in the NiCrFe and stainless steel RV internal components (including RV internal components fabricated from CASS) that are exposed to the borated water environment.

As described under "Aging Management Programs or Activities Credited with Aging Management," the staff requested in RAI 3.1.3.1.1-1, Part b, that the applicant provide its technical bases for considering only the Water Chemistry Control Program to be sufficient to manage the loss of material in NiCrFe and stainless steel (including CASS) RV internal components without including an inspection-based AMP to confirm that the Water Chemistry Control Program is accomplishing its mitigative function. As an alternative, the staff asked the applicant to propose an acceptable inspection-based AMP for the management of the loss of material in the specific NiCrFe or stainless steel RV components. The staff identified that RAI 3.1.3.1.1-1, Part b, also applied to the staff's evaluation of the applicant's AMPs credited with managing the loss of material in NiCrFe, stainless steel, and CASS RV internal components.

As discussed in Section 3.1.2.3.1.2 of this SER, under the subsection "Aging Management Programs," the applicant's response to RAI 3.1.3.1.1-1, Part b, provided an acceptable explanation for using the Water Chemistry Control Program as a basis for minimizing the dissolved oxygen and ionic impurity concentrations that could otherwise, if left present in high concentrations, lead to an aggressive, oxidizing RCS coolant environment. The GALL Report does not indicate that the loss of material due to pitting or crevice corrosion is an aging effect of concern for stainless steel or NiCrFe ASME Code, Class 1, components. Since the applicant has conservatively assumed that the loss of material due to pitting or crevice corrosion is an applicable aging effect for all of the RV internal components identified as fabricated from stainless steel or NiCrFe materials, the staff concludes that the Water Chemistry Control Program provides a sufficient mitigative strategy for managing this aging effect relative to the recommendations of the GALL Report. Therefore, RAI 3.1.3.1.2-1, Part b, is resolved with respect to the AMPs that are credited for managing the loss of material in the stainless steel or NiCrFe RV internals components as a result of pitting or crevice corrosion. Section 3.0.3.2.1 of this SER provides the staff's evaluation of the Water Chemistry Control Program.

In its response to RAI 3.1.3.1.1-1, Part a, the applicant confirmed that the upper core plate alignment pins, holddown springs, clevis inserts and fasteners, radial support keys and fasteners, and flux detector thimble tubes are the RV internal components that could potentially be subject to the loss of material due to wear as a result of the exposure of the components to the borated water environment.

In commodity group IV.B2.1-l of GALL, Volume 2, the staff evaluates the loss of material in upper core plate alignment pins associated with the upper internals assembly and recommends crediting the ASME Code, Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD Program for ASME Code Class 1 components with management of the aging effect. In commodity group IV.B2.5-o of GALL, Volume 2, the staff evaluates the loss of material in radial keys and clevis inserts associated with the lower internal assembly and recommends crediting the ASME Code, Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD Program with management of this aging effect.

The current ASME Code, Section XI, ISI requirement for inspection of nonwelded RV internals is that specified in Table IWB-2500-1, Inspection Category B-N-1, Inspection Item B13.10. This ASME inspection item requires that U.S. nuclear licensees perform visual VT-3 inspections of the accessible areas internal to the reactor vessel once every inspection period.

The applicant determined that its AMR for managing the loss of material in the upper core plate alignment pins associated with the FNP upper internals assemblies was consistent with the AMR in GALL commodity group IV.B2.1-l. The applicant decided that its AMR for managing the loss of material in the radial keys and clevis inserts associated with the FNP lower internal assemblies was consistent with the corresponding AMR in GALL commodity group IV.B2.5-o. At FNP, these components are fabricated from stainless steel. Based on these determinations, the applicant credited the Inservice Inspection Program with the management of the loss of material in these components. In Section 3.1.2.1 of this SER, the staff evaluated the applicant's crediting of the Inservice Inspection Program for management of the loss of material in these components and determined that it was acceptable.

The applicant has also identified that loss of material is an applicable aging effect for the RV internals holddown springs, which at FNP are fabricated from stainless steel. Section IV.B of GALL, Volume 2, does not include a corresponding AMR commodity group for evaluating loss of material in RV internals holddown springs. The applicant credited both the Inservice Inspection Program and the Water Chemistry Control Program with the management of the loss of material in the RV internals holddown springs.

The applicant's AMPs for managing the loss of material in the RV internals holddown springs are identical to those credited for managing the loss of material due to wear in the radial support keys and fasteners and the upper core plate alignment pins. They are therefore based on the same ASME Code VT-3 inspection strategies and water chemistry control practices proposed for managing the aging effects in the radial support keys and fasteners and the upper core plate alignment pins. Because the functions, materials, and environments for the RV internals holddown springs are similar to those for the radial support keys and fasteners and upper core plate alignment pins, the staff concludes that the Inservice Inspection Program and Water Chemistry Control Program are acceptable AMPs for managing the loss of material in the RV internals holddown springs.

Based on this assessment, the staff concludes the Inservice Inspection Program and Water Chemistry Control Program are acceptable AMPs for managing the loss of material in the RV internals upper core plate alignment pins, holddown springs, clevis inserts and fasteners, and radial support keys and fasteners. Sections 3.0.3.1 and 3.0.3.2.1 of this SER provides the staff's evaluation of the Inservice Inspection Program and Water Chemistry Control Program, respectively.

For managing the loss of material in the in-core flux detector thimble tubes, the applicant credited both the Flux Detector Thimble Inspection Program and the Water Chemistry Control Program. The AMR for commodity group IV.B2.6-c of GALL, Volume 2, recommends using the following two AMPs for the management of the loss of material due to wear in in-core flux thimbles (tubes):

(1) ASME Code, Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD Program for ASME Code Class 1 components

(2) a plant-specific inspection program designed to address the technical issues and criteria of NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," issued July 26, 1988

The applicant's decision to credit the Flux Detector Thimble Inspection Program for managing the loss of material due to wear in the flux detector thimble tubes is consistent with commodity group IV.B2.6-c of GALL, Volume 2, and with the staff's position that a plant-specific inspection program should be credited for the management of wear in flux detector thimble tubes.

Therefore, the applicant's crediting of the Flux Detector Thimble Inspection Program for aging management is acceptable to the staff. The staff evaluates the ability of the Flux Detector Thimble Inspection Program to manage wear in the FNP flux detector thimble tubes in Section 3.0.3.3.1 of this SER.

Commodity group IV.B2.6-c of GALL, Volume 2, also recommends crediting the ASME Code, Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD Program for ASME Code Class 1 components with managing the loss of material due to wear in the flux detector thimbles. Inspection Categories B-N-1 and B-P of Table IWB-2500-1 in ASME Code, Section XI, apply to these components. The applicant did not credit the Inservice Inspection Program for management of the loss of material due to wear in the flux detector thimble tubes at FNP. The staff requested the applicant to provide its basis for not crediting the Inservice Inspection Program with aging management of the loss of material due to wear in the flux detector thimble tubes. The staff identified this issue as RAI 3.1.3.2.1-1.

The applicant provided its response to RAI 3.1.3.2.1-1 in SNC Letter No. NL-04-0617, dated April 16, 2004. In its response to RAI 3.1.3.2.1-1, the applicant stated that the nominal pipe/tube size of the FNP flux detector thimble tubes is less than 1.0 inch in diameter and that ASME Code, Section XI, exempts small-bore piping from the volumetric and surface examination requirements of IWB-2500. The staff has confirmed that paragraph IWB-1220 of ASME Code, Section XI, exempts pipes/tubes with nominal sizes less than 1.0 inch in diameter from volumetric and surface examinations. The staff therefore concludes that the applicant has provided an acceptable basis for not crediting the ASME Code, Section XI, volumetric examination and surface examination requirements for the flux detector thimble tubes.

Inspection Category B-N-1, Inspection Item B13.10, of ASME Code, Section XI, requires the performance of visual VT-3 examinations on the interior of the reactor vessel once every refueling outage. The Flux Detector Thimble Inspection Program uses ECT to monitor for wear in the flux detector thimble tubes, which is a volumetric inspection method for thin-walled tubing, such as flux detector thimble tubing or SG tubing. Industry experience has demonstrated that ECT examinations performed on Westinghouse-designed flux detector thimble tubes can detect wear-induced loss of material in these components and that ECT is a conservative method for implementing the VT-3 examinations required by ASME Code, Section XI. Since the ECT examinations are sufficient by themselves to monitor for wear in the flux detector thimble tubes, the staff concurs that the applicant need not credit the VT-3 examinations required by the ASME Code, Section XI, for the flux detector thimble tubes. However, although the applicant will not credit ASME Code, Section XI, Inspection Category B-N-1, Inspection Item B13.10, for the FNP LRA, it must still perform the required VT-3 examinations of the FNP RV interior during each refueling outage for the period of extended operation for the FNP units, unless the applicant requests and receives appropriate relief from the staff, pursuant to the provisions of 10 CFR 50.55a(a)(3). Based on this evaluation, the staff concludes that the applicant has provided an acceptable basis for handling the loss of material due to wear in the flux detector thimble tubes without the need to credit the Inservice Inspection Program for aging management. Therefore, RAI 3.1.3.2.1-1 is resolved.

The staff has reviewed the applicant's AMRs for evaluating the loss of material in ASME, Code Class 1, RV internal components that are made from stainless steel or NiCrFe materials and are exposed to borated water. The staff concludes that the applicant has credited an acceptable basis for concluding that the Water Chemistry Program is sufficient to manage the loss of material in these components as a result of pitting or crevice corrosion. The staff also concludes that the applicant has credited acceptable inspection-based AMPs to manage the loss of material in the RV internals upper core plate alignment pins, holddown springs, clevis inserts and fasteners, radial support keys and fasteners, and flux detector thimble tubes as a result of wear.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the reactor vessel, internals, and RCS SSCs with the environments described in Tables 3.1.2-1 through 3.1.2-4 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects that are appropriate for the material-environment combinations listed.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3 Reactor Coolant System and Connected Lines Aging Management Review Results

Summary of Technical Information in the Application

Table 3.1.2-3 of the LRA provides the applicant's specific AMRs for components that comprise the FNP reactor vessel coolant system. These components include the reactor coolant piping, system piping, pressurizer, and components. This SER evaluates the applicant's identification of aging mechanisms and AMPs for items designated as letters F through J in the subject table.

Loss of Material in Austenitic Stainless Steel or Nickel-Based Alloy RCS Piping and Fitting Components Under Exposure to the Borated Water Environment

Summary of Technical Information in the Application

The applicant identified that loss of material is an applicable aging effect for NiCrFe components and stainless steel RCS piping and fitting components that are exposed to borated water environments. It categorized its AMR for these components as one for which the GALL Report did not identify an aging effect for the material-environmental combinations for the components (i.e., notes H and J in Table 3.1.2-3). The scope of this commodity group includes the following components:

- Class 1 piping—reactor coolant loop (CASS)
- small-bore Class 1 piping less than NPS 4 (stainless steel)
- Class 1 piping greater than or equal to NPS 4 (stainless steel)
- Class 1 valve bodies (stainless steel)

- Class 1 flow orifices or elements (stainless steel)
- RCP casing (CASS)
- RCP main closure flange (CASS)
- pressurizer heater sheaths (austenitic stainless steel)
- pressurizer instrumentation nozzle and heater well nozzles (stainless steel)
- pressurizer manway and cover (alloy steel with stainless steel insert)
- pressurizer nozzle safe ends (stainless steel with Alloy 82/182 welds and buttering, NiCrFe weld filler metals)
- pressurizer surge, spray, safety, and relief nozzles (alloy steel with stainless steel cladding)
- pressurizer shell, upper head, and lower head (alloy steel with stainless steel cladding)
- pressurizer spray head assembly (CASS)
- pressurizer surge and spray nozzle thermal sleeves (stainless steel with Alloy 82/182 welds, NiCrFe weld filler metals)
- non-Class 1 RCS piping (stainless steel)
- non-Class 1 valve bodies (stainless steel)
- RCP thermal barrier assembly

The applicant credited the Water Chemistry Program and the One-Time Inspection Program with the management of the loss of material in these components.

Identification of Aging Effects

The applicant identified the loss of material as an applicable aging effect for NiCrFe components and stainless steel RCS piping and fitting components that are exposed to borated water environments. These components include carbon steel or low-alloy steel components that are clad with austenitic stainless steel that is exposed to the borated water environments.

The applicant did not identify in Section 3.1 of the LRA or in LRA Table 3.1.2-3 which aging mechanisms it considered capable of inducing a loss of material in the stainless steel (including stainless steel clad components) or NiCrFe RCS piping and fitting components exposed to borated water. The staff required additional information on this matter. Specifically, for each of these components, the staff requested that the applicant define the aging mechanisms it considered able to induce a loss of material in the components. The staff identified this issue as RAI 3.1.3.1.1-1, Part a. The staff also informed the applicant that this RAI applied to comparable NiCrFe and stainless steel RV internals components within the scope of Table

3.1.2-2 and comparable NiCrFe and stainless steel RV components within the scope of Table 3.1.2-1. Part a of RAI 3.1.3.1.1-1 applies to the following RCS piping and fitting components:

- Class 1 piping—reactor coolant loop (CASS)
- small-bore Class 1 piping less than NPS 4 (stainless steel)
- Class 1 piping greater than or equal to NPS 4 (stainless steel)
- Class 1 valve bodies (stainless steel)
- Class 1 flow orifices or elements (stainless steel)
- RCP casing (CASS)
- RCP main closure flange (CASS)
- pressurizer heater sheaths (austenitic stainless steel)
- pressurizer instrumentation nozzle and heater well nozzles (stainless steel)
- pressurizer manway and cover (alloy steel with stainless steel insert)
- pressurizer nozzle safe ends (stainless steel with Alloy 82/182 welds and buttering, NiCrFe weld filler metals)
- pressurizer surge, spray, safety, and relief nozzles (alloy steel with stainless steel cladding)
- pressurizer shell, upper head, and lower head (alloy steel with stainless steel cladding)
- pressurizer spray head assembly (CASS)
- pressurizer surge and spray nozzle thermal sleeves (stainless steel with Alloy 82/182 welds, NiCrFe weld filler metals)
- non-Class 1 RCS piping (stainless steel)
- non-Class 1 valve bodies (stainless steel)
- RCP thermal barrier assembly

Section 3.1.2.3.1.2 of this SER discusses the staff's review of the applicant's response to RAI 3.1.3.1.1-1, Part a, regarding the aging mechanisms that can lead to the loss of material in the NiCrFe and stainless steel RCS piping and fitting components listed in LRA Tables 3.1.2-1, 3.1.2-2, and 3.1.2-3 under exposure to the borated water environment.

Aging Management Programs or Activities Credited with Aging Management

The applicant has credited the Water Chemistry Program and the One-Time Inspection Program for the management of the loss of material that may occur in the NiCrFe and stainless steel RCS piping and fitting components that are exposed to the borated water environment.

Pitting and crevice corrosion may occur in ASME Code, Class 1, stainless steel or NiCrFe piping components under exposure to aggressive, oxidizing environments. Normally, the presence of elevated dissolved oxygen and/or aggressive ionic impurity concentrations is necessary to create these oxidizing environments in the RCS. In RAI 3.1.3.1.1-1, Part a, the staff inquired whether loss of material due to either wear or erosion was an applicable aging for ASME Code Class 1 pressurizer or RCS piping and fitting components that are made from either stainless steel (including CASS) or NiCrFe materials. In the applicant's response to RAI 3.1.3.1.1-1, Part a, the applicant did not identify that stainless steel (including CASS) or NiCrFe components in the pressurizer or RCS piping systems could be impacted by loss of material due to wear. The applicant did conservatively identify that loss of material due pitting or crevice corrosion is an applicable aging effect for stainless steel or NiCrFe components in the pressurizer or RCS piping systems and fitting components. In the evaluation in Section 3.1.2.3.1.2 of this SER, the staff evaluated and justifies why the Water Chemistry Control Program is sufficient to manage pitting and crevice corrosion in stainless steel/NiCrFe ASME Code Class 1 components, including ASME Code Class 1 pressurizer and RCS piping and fitting components made from stainless steel or NiCrFe materials.

The applicant credited both the One-Time Inspection Program and the Water Chemistry Control Program with the management of the loss of material from the pressurizer spray head assembly, a CASS component. Commodity group IV.C.2.5.4 of GALL, Volume 2, lists the aging effect of cumulative fatigue damage/fatigue as an applicable aging effect for CASS, to be supported by a TLAA for the pressurizer spray head. Table 3.1.1, Item 3.1.1-12, omits this aging effect (cumulative fatigue damage), although the applicant listed the material for the pressurizer spray head assembly as CASS. Section 4.3 of this SER discusses the staff's evaluation of the credit given by the applicant to the TLAA for the RCPB. Section B.5.5 of this SER evaluates the One-Time Inspection Program. The staff required further information regarding whether the applicant manages fatigue aging effect of cracking due to cumulative fatigue in the CASS pressurizer spray head assembly through the TLAA. Therefore, RAI 3.1.3.3-1 stated that Tables 3.1.1 and 3.1.2-3 do not list the CASS pressurizer spray head assembly as susceptible to cracking due to thermal fatigue, nor do they indicate that a TLAA exists to address aging management for this component. For this component and commodity group (IV.C.2.5.4), GALL recommends a TLAA to address cumulative fatigue damage. The staff asked the applicant to provide further information regarding whether this plant-specific component is susceptible to the AERM.

In its response to RAI 3.1.3.3-1, the applicant stated that, for FNP, SNC normally manages cracking due to thermal fatigue through a TLAA or through the Fatigue Monitoring Program. However, the spray head assembly is not a part of the pressure-retaining boundary, as defined by the ASME Code. Accordingly, SNC does not have fatigue calculations associated with this assembly and no corresponding cumulative fatigue usage factor prediction to maintain for this assembly. Therefore, the applicant stated that it has no TLAA to address cumulative fatigue damage for the pressurizer spray head assembly.

The applicant noted that, although it has no TLAA for the spray head assembly, the corresponding pressurizer nozzle forms part of the pressure-retaining boundary and therefore has a fatigue calculation. The applicant manages cracking due to thermal fatigue for this spray nozzle through a TLAA and the Fatigue Monitoring Program. The spray nozzle thermal transient cycles correlate to those experienced by the spray head assembly. The management of thermal fatigue for the spray nozzle confirms, for both the spray nozzle and the spray head assembly, that the fatigue cycles experienced remain within the original design parameters.

The applicant's description of the physical configuration and operating parameters for the FNP spray heads minimizes the potential for cracking due to thermal fatigue cycling. The FNP CASS spray head is threaded onto a stainless steel coupling, which is welded to the pressurizer's hemispherically shaped upper head. A stainless steel locking bar that is tack welded to the spray head on one end, and the pressurizer upper head at the other end, precludes the loosening of the spray head threaded joint. This configuration does not restrain thermal movement, with the possible exception of the locking bar tack weld areas. No significant pressure stresses are present, since the operating pressures on both sides of the spray head are similar. Finally, FNP operates with a continuous flow of coolant through the spray head, thereby significantly reducing the number and magnitude of thermal transients affecting the spray head assembly. Since thermal movement is not restrained, and low fatigue usage is expected, SNC concluded that cracking of the FNP spray head assemblies due to fatigue cycling is not likely.

Finally, the applicant stated that Table 3.1.2-3 of the LRA identifies cracking as an AERM for the pressurizer spray head assembly. The applicant credited a one-time, visual VT-1 examination of higher stress regions associated with the pressurizer spray head assembly to identify any cracking, whether induced by SCC or caused by fatigue cycling. Based on the applicant's description of the configuration and the operation of the pressurizer spray head with continuous spray, the staff concludes that the Fatigue Monitoring Program and the One-Time Inspection Program adequately manage the nozzle configuration aging mechanisms. Section B.5.7 of this SER evaluates the Fatigue Monitoring Program, and Section B.5.5 of this SER evaluates the One-Time Inspection Program. Therefore, the staff considers RAI 3.1.3.3-1 to be closed.

With the acceptable resolution of RAIs 3.1.3.1.1-1, Parts a and b; and B.5.8-1, the staff concludes that the applicant's AMRs for evaluating the loss of material in RCS Class 1 piping and components fabricated from Alloy 82/182 welds, stainless steel, or CASS under internal exposure to the borated water environment adequately identify and manage the effects of aging and are, therefore, acceptable. The staff has determined that the applicant provided an acceptable basis for managing loss of material in RCS Class 1 piping and fitting components fabricated from Alloy 82/182 welds, stainless steel, and CASS under internal exposure to the borated water environment. The staff concludes that the applicant proposed acceptable AMPs for managing the loss of material as a result of crevice corrosion, and pitting corrosion in the stainless steel and NiCrFe components listed in Table 3.1.2-3.

The staff has reviewed the applicant's AMRs for evaluating the loss of material in the ASME Code RCSs and connected lines listed under Table 3.1.2-3 that are made from stainless steel or NiCrFe materials and exposed to borated water. The staff concludes that the applicant has credited an acceptable basis for concluding that its Water Chemistry Control Program is sufficient to manage the loss of material in these components as a result of pitting or crevice corrosion.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Loss of Material in Low-Alloy steel or Carbon Steel RCS Piping and Fitting Components That Are Exposed Externally to Inside (Atmospheric) Environments

Summary of Technical Information in the Application

The applicant identified loss of material as an AERM for low-alloy steel and carbon steel components that are exposed externally to the inside (atmospheric) environment (note H). The scope of this commodity group includes the following components:

- Class 1 closure bolting (alloy steel)
- RCP main flange bolting (alloy steel)
- pressurizer closure bolting (alloy steel)
- pressurizer manway cover (alloy steel with a stainless steel insert)
- pressurizer nozzles (surge, spray, safety and relief nozzles—low-alloy steel with stainless steel cladding)
- pressurizer shell, upper head, and lower head (alloy steel with stainless steel cladding)

The applicant credited the Borated Water Leakage Assessment and Evaluation Program with the management of the loss of material in these components.

Identification of Aging Effects

As discussed in Section 3.0.3.1 of this SER, industry experience has demonstrated that the loss of material due to boric acid corrosion and boric acid-induced wastage may occur in the external surfaces of ASME Code, Class 1, alloy steel and carbon steel components as a result of exposure to potential leaks to the reactor coolant (i.e, leaks of the borated water). Based on this analysis, the staff concludes that the applicant's identification of the loss of material due to boric acid corrosion as applicable to the external surfaces of the alloy steel and carbon steel RCS piping and fitting components is acceptable. The applicant provided its response to RAI 3.1.3.1.2-1, Part a, in SNC Letter No. NL-04-0617, dated April 16, 2004. In this response, the applicant confirmed that it identified the loss of material due to boric acid corrosion as an applicable aging effect for the surfaces of carbon steel or low-alloy steel RCS piping and fitting components that are exposed to the inside air environments and could potentially be exposed to leakage of the borated reactor coolant. The staff finds this consistent with the corresponding AMRs in GALL, Volume 2, and therefore acceptable.

Aging Management Programs

The applicant credited the Borated Water Leakage Assessment and Evaluation Program with the management of the loss of material from the external surfaces of the alloy steel or carbon steel RCS piping and fitting components that are exposed to the inside environment. In crediting this AMP for aging management, the applicant implied that it considers the loss of material possible only from the external surfaces of alloy steel and carbon steel RCS piping and fitting components if through-wall leakage of the borated coolant occurs in the components. In RAI 3.1.3.1.2-1, Part a, the staff requested additional information regarding the aging mechanisms that could induce the loss of material from the external surfaces of alloy steel and carbon steel RV, RCS piping, and pressurizer components under exposure to inside environments. The staff asked the applicant to explain why it considers the Borated Water Leakage Assessment and Evaluation Program sufficient to manage the loss of material in external surfaces of alloy steel and carbon steel RCS piping and fitting components, particularly if aging mechanisms other than boric acid leakage and boric acid-induced wastage are known to induce the loss of material aging effect. The staff identified this issue as RAI 3.1.3.1.2-1, Part b, which also applied to the evaluation of the loss of material in alloy steel or carbon steel RCS piping or pressurizer components under external exposure to the inside environment.

In its review of the applicant’s response to Part a of RAI 3.1.3.1.2-1, dated April 16, 2004, the staff concurred with the applicant that the loss of material due to general corrosion is not an AERM for the external surfaces of ASME Code, Class 1, carbon steel or low-alloy steel RCS piping and fitting components because of the high operating temperatures of the components and because precipitation on the external surfaces was unlikely. In its response to Part b of RAI 3.1.3.1.2, dated April 16, 2004, the applicant indicated that an AMP is not necessary for managing general corrosion in these components because general corrosion is not identified as an applicable aging effect for the components. Based on the staff’s review of the applicant’s response to RAI 3.1.3.1.2-1, Part a, and concurrence that general corrosion is not an aging effect of concern for the external surfaces of carbon steel/low-alloy steel RCS piping and fitting components, the staff agrees that an AMP is not necessary to manage general corrosion in the external surfaces of carbon steel or low-alloy steel RCS piping and fitting components. Therefore, RAI 3.1.3.1.2, Part b, is resolved.

As discussed in Sections 3.0.3.1 and 3.0.3.1.1 of this SER, industry experience has demonstrated that the loss of material due to boric acid leakage and boric acid-induced wastage (i.e., boric acid-induced corrosion) may occur in the external surfaces of ASME Code, Class 1, low-alloy steel and carbon steel components that could potentially be exposed to leaks to the reactor coolant (i.e., leaks of the borated water). The NRC issued GL 88-05 to address the impacts of this issue on the PWR industry. Based on this operating experience, Section IV of GALL, Volume 2, identifies that the loss of material due to boric acid corrosion is an AERM for external surfaces of carbon steel and low-alloy steel components. The staff concludes that crediting the Borated Water Leakage Assessment and Evaluation Program with the management of the loss of material due to boric acid leakage and wastage for the surfaces of low-alloy steel or carbon steel RCS piping and fitting components that are exposed to the inside environment is acceptable because it is consistent with GALL, Volume 2, and industry experience. The staff evaluates the Borated Water Leakage Assessment and Evaluation Program in Sections 3.0.3.1 and 3.0.3.1.1 of this SER.

The staff has reviewed the applicant’s AMRs for evaluating the loss of material in ASME Code, Class 1, RCS piping and fitting components that are made from carbon steel or low-alloy steel materials and that are exposed to the inside environment. The staff concludes that the applicant has provided an acceptable technical basis for concluding that the loss of material due to general corrosion is not an applicable AERM for the external component surfaces that are exposed to the inside environment. The staff also concludes that the applicant has credited an acceptable AMP with managing the loss of material from the external surfaces of carbon steel or low-alloy steel RCS piping and fitting components that could potentially be exposed to borated reactor coolant.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Loss of Material in NiCrFe, Stainless Steel, and CASS RCS Piping and Pressurizer Components That Are Exposed Externally to Inside (Atmospheric) Environments</u>

Summary of Technical Information in the Application

In Table 3.1.2-3 of the LRA, the applicant provided its AMRs for evaluating the effects of aging that apply to NiCrFe and stainless steel ASME Code, Class 1, piping and pressurizer components that are exposed externally to the inside (atmospheric) environment. The applicant concluded in these AMRs that exposure of the external surfaces of the NiCrFe and stainless steel RCS piping and fitting components to the inside environment will not result in any aging effects that require management during the period of extended operation for the FNP units. The applicant designated these AMRs as note G.

The scope of this commodity group assessment includes the following components:

- reactor coolant loop piping (CASS)
- piping and components less than NPS 4 (stainless steel)
- piping and components greater than or equal to NPS 4 (stainless steel)
- Class 1 valve bodies (stainless steel)
- flow orifice/elements Class 1 (stainless steel)
- RCP pump casing (CASS)
- RCP main closure flange (CASS)
- pressurizer instrument nozzles and heater well nozzles (stainless steel)
- pressurizer nozzle safe ends (stainless steel with Alloy 82/182 welds and buttering)
- piping—non-Class 1 (stainless steel)
- valve bodies—non-Class 1 (stainless steel)

The applicant concluded that there are no aging effects that require aging management for the outside surfaces of NiCrFe, CASS, and stainless steel RCS piping and pressurizer components that are exposed externally to the inside environment. Nonbolted ASME Code, Class 1, NiCrFe and stainless steel materials are designed to resist mechanisms that may precipitate corrosion-induced cracking or loss of material under exposure to moist, damp, or wet air environments.

Identification of Aging Effects

Volume 2 of the GALL Report does not list an AERM because of the internal atmosphere of containment for this commodity group of items (designated as note G in Table 3.1.2-3 of the LRA). Secondly, published data and industry experience indicate that a large variety of stainless steels suffer no loss of material or detrimental effects from environments of oxygen or inert atmospheres such as those encountered in a PWR containment. Based on industry experience and consistent with GALL, Volume 2, the staff considers the designation of no aging effect for this commodity group inside containment acceptable.

Aging Management Programs or Activities Credited with Aging Management

The applicant did not credit any AMPs for the management of loss of material or cracking in the surfaces of nonbolted ASME Code, Class 1, NiCrFe and stainless steel components under exposure to the inside environment. Since these components are designed to resist corrosion under exposure to air environments, the staff concurs that aging management is not necessary for the surfaces of these components that are exposed to the inside environment. Based on industry experience and consistent with GALL, Volume 2, the staff considers the designation of no aging program for this commodity group inside containment acceptable.

The staff has reviewed the applicant's AMRs for evaluating whether loss of material is an aging mechanism that requires aging management for the outside surfaces of NiCrFe, CASS, and stainless steel RCS piping and pressurizer components that are exposed externally to the inside environment. The staff has determined that the applicant provided an acceptable basis for concluding that there is no aging mechanism for this commodity group. The staff therefore concludes that the applicant has appropriately designated that there is no AMP for this commodity group, consistent with GALL; therefore, the staff finds this approach acceptable.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.4 Steam Generators Aging Management Review Results

Summary of Technical Information in the Application

In LRA Section 3.1.2.1.4, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that handle the AERMs for the SG components:

- Water Chemistry Control Program
- Inservice Inspection Program
- NiCrFe Component Assessment Program
- Steam Generator Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.2.4-1 of the LRA, the applicant summarized the AMRs for the SG components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section 3.1, Table 3.1.2-4, and Appendix B to determine if the applicant demonstrated that it will manage the effects of aging adequately so that the intended functions of the SG components will be maintained consistent with the CLB throughout the period of extended operation.

Aging Effects

The staff reviewed and evaluated the applicability of the aging effects listed in LRA Table 3.1.2-4 for the SG components within the scope of license renewal.

In LRA Section 3.1.2.2.1, "Cumulative Fatigue Damage," the applicant stated that it uses a TLAA to manage fatigue for several components in the SGs. Title 10, Section 54.3, of the *Code of Federal Regulations* (10 CFR 54.3) defines TLAAs, which must be evaluated in accordance with 10 CFR 54.21(c)(1). The Fatigue Monitoring Program manages the fatigue TLAA for fatigue-sensitive safety Class 1 components having evaluations based on the current operating term. The GALL Report lists several SG components with fatigue as an aging effect and bounded by a TLAA. Section 4.3 of this SER reviews and evaluates the fatigue TLAA.

Components Not Consistent with the GALL Report

The GALL Report does not evaluate the following SG components; the applicant's LRA Table 3.1.2-4 denotes that the GALL Report evaluates neither the component, nor the material-environment combination:

- Alloy 690 thermally treated channel divider plate (LRA page 3.1-72)
- carbon steel primary moisture separator and sludge collector assembly (LRA page 3.1-74)
- Alloy 690 thermally treated primary nozzle dam rings (LRA page 3.1-75)
- carbon steel secondary moisture separator assembly (LRA page 3.1-75)
- alloy steel secondary-side manways, manholes, inspection ports, and covers (LRA page 3.1-75)
- carbon steel stayrod assemblies (LRA page 3.1-75)
- Alloy 690 thermally treated steam outlet flow limiter (LRA page 3.1-76)
- carbon steel tube bundle wrapper and support assembly (LRA page 3.1-76)
- alloy steel tubesheet clad with Alloy 52/152 on primary side (LRA page 3.1-77)

By letter dated March 22, 2004, in RAI 3.1.2.4-1, the staff requested that the applicant discuss which program it would use to detect cracking and loss of material in the Alloy 690 thermally treated components in order to assess the adequacy of the Water Chemistry Control Program. The components include the channel divider plate, primary nozzle dam rings, and steam outlet flow limiter. The staff requested that the applicant discuss the program it will use to detect cracking and loss of material in these SG components. The staff requested that the applicant discuss how it will use this program to detect degradation, thereby verifying that the Water Chemistry Control Program alone can effectively manage aging of these components during the period of extended operation (e.g., water chemistry control is augmented with an inspection to detect the aging effects, or the Water Chemistry Control Program has a one-time inspection which includes this material-environment combination). The staff also requested that the applicant identify the aging mechanisms responsible for the aging effects listed for these components.

In its response to RAI 3.1.2.4-1, dated April 22, 2004, the applicant responded that it credited only the Water Chemistry Control Program with management of cracking and loss of material for the replacement SG channel divider plate, primary nozzle dam rings, and steam outlet flow limiters. The aging mechanism associated with cracking is SCC, and the aging mechanisms associated with loss of material are crevice corrosion and pitting. The inspection of these components does not augment the Water Chemistry Control Program; the applicant justified this position by stating that SNC has conservatively considered cracking and loss of material as aging effects that require management for these components, and that these aging effects are unlikely to occur with the existing chemistry controls provided by the applicant’s Water Chemistry Control Program. The applicant stated that these SG components are fabricated from thermally treated Alloy 690 base metal and Alloy 52/152 weld materials, and a review of the available industry operating experience indicates that no cracking or loss of material in thermally treated Alloy 690 base metal and Alloy 52/152 weld materials has occurred to date in the PWR primary and secondary environments. The applicant also noted that available experimental data and industry experience associated with Alloy 690 base metal and Alloy 52/152 weld materials indicate that the primary and secondary chemistry controls implemented by the applicant’s Water Chemistry Control Program are sufficient to prevent SCC, pitting, and crevice corrosion of these SG components. Regarding SCC, the applicant stated that a number of industry studies indicate that the increased chromium content and improved microstructure of thermally treated Alloy 690 base metal and Alloy 52/152 weld materials result in a significant increase in resistance to PWSCC over mill-annealed Alloy 600 base metal and Alloy 82/182 weld materials.

Regarding pitting and crevice corrosion, the applicant stated that the surfaces of components made from these alloys exhibit a dense passivation layer, which protects the material from the loss of material due to localized corrosion, especially in the pure primary water and main steam environments. Furthermore, the applicant stated that the components addressed by this RAI are not in locations that have been associated with significant degradation, even when less corrosion-resistant mill-annealed Alloy 600 base metal and Alloy 82/182 weld materials are utilized. Any degradation of the applicant’s replacement SG Alloy 690/52/152 materials is expected to occur in areas where higher stresses and more aggressive environmental conditions exist, such as the tube-to-tubesheet expansion region, tube-to-tube support plate intersections, and primary nozzle-to-safe-end welds. Existing inspections and evaluations of these and other corrosion-prone locations will provide a leading indication of any susceptibility of thermally treated Alloy 690 base metals and Alloy 52/152 weld materials to corrosion in the borated water and main steam environments. The applicant monitors industry operating experience and initiates inspection activities as needed. In addition, SNC noted that the components addressed by this RAI are internal to the SGs and do not perform an RCPB function. Table 3.1.2-4 of the LRA lists the applicable component intended functions for each component type. Cracking or loss of material in these components is only significant for safety if the degradation results in a loss of structural integrity which has not been observed because of the highly corrosion-resistant nature of Alloy 690 materials.

For the channel divider plate, the applicable component intended functions are flow distribution and structural support. The loading on the channel divider plate is the differential pressure across the divider plate and is equivalent to the pressure drop across the SG tube bundle. Therefore, stress on the divider plate during normal operations is very low. Pitting, SCC, or crevice corrosion of the channel divider plate would only result in minimal leakage from the higher pressure hot-leg inlet to the lower pressure cold-leg outlet and would not be significant for safety.

For the primary nozzle dam rings, the applicant stated that structural support is the applicable component intended function. When nozzle dams are not installed, the loading on the primary nozzle dam rings is low, and results from the minor differential pressure/frictional losses resulting from primary loop flow across the ring. When nozzle dams are installed (during an outage), the loading on the rings is also low and is equivalent to the static head of the reactor vessel/refueling cavity water level. Significant degradation in a nozzle dam ring would be identified during nozzle dam installation. Leakage across the nozzle dam and ring is monitored. In addition, failure of a nozzle dam assembly would not drop the RCS water level below the midloop level; core coverage and cooling would be maintained. The applicant stated that flow restriction is the applicable component function for the steam outlet flow limiters. In the high purity main steam environment, only trace amounts of detrimental ionic impurities are present, and very low oxygen content exists. In this environment, SCC, pitting, and crevice corrosion are highly unlikely. Even so, any cracking, pitting, or crevice corrosion is not likely to affect the flow restriction function, since only structural integrity of the limiter must be maintained.

The staff finds that the applicant’s Water Chemistry Control Program adequately manages cracking and loss of material in the channel divider plate, primary nozzle dam rings, and steam outlet flow limiter. These SG components are made from corrosion-resistant materials, which have shown no instances of cracking or loss of material, based on industry experience. In addition, inspections of the Alloy 690 thermally treated SG tubes in highly stressed locations will provide a leading indication of the susceptibility of these materials to degradation.

With respect to the primary moisture separator and sludge collector assembly, secondary moisture separator assembly, secondary-side manways, manholes, inspection ports, and covers, stayrod assemblies, tube bundle wrapper and support assembly, and tubesheet, the staff finds that the applicant has correctly identified the aging effects of cracking and/or loss of material for these components, and that the identified AMPs will adequately manage these aging effects. The staff based its findings on the known aging effects for these materials exposed to treated and borated water environments.

Components Consistent with the GALL Report with Exceptions

The GALL Report only partially evaluates the following SG components, which LRA Table 3.1.2-4 denotes as such:

- alloy steel/stainless steel clad channel head and integral primary nozzles (LRA page 3.1-72)

- alloy steel secondary closure bolting (LRA page 3.1-73)
- carbon steel, alloy steel, and Alloy 690 thermally treated feedwater distribution assembly (thermal sleeve, piping and fittings, spargers, support structure) (LRA page 3.1.73)
- alloy steel feedwater inlet nozzle (LRA page 3.1.73)
- stainless steel (with NiCrFe Alloy 52/152 buttering and welds) primary inlet and outlet nozzle safe ends (LRA page 3.1-74)
- alloy steel/stainless steel primary manway covers and disc inserts (LRA page 3.1-74)
- alloy steel secondary shell penetrations (LRA page 3.1-76)
- stainless steel, Alloy 690 thermally treated tube support plates, flow distribution baffles, and antivibration bars (LRA page 3.1-77)
- Alloy 690 thermally treated U-tubes (includes welded tube plugs) (LRA page 3.1-78)
- alloy steel/Alloy 52/152 upper head with integral steam nozzle (LRA page 3.1-79)
- alloy steel upper shells, lower shells, and transition cones (LRA page 3.1-79)

Table 3.1.2-4 of the LRA, page 3.1-73, lists no aging effect for secondary closure bolting. In addition, the applicant stated in note 8 to the table that the secondary handholes are removed to facilitate sludge removal and visual inspection; therefore, the applicant concluded that the loss of bolting preload is not an AERM. However, the staff notes that the secondary handhole bolting may still be subjected to a loss of prestress. The staff also notes that GALL AMP XI.M18, "Bolting Integrity," covers all bolting within the scope of license renewal, including safety-related bolting, bolting for nuclear steam supply system component supports, bolting for other pressure-retaining components, and structural bolting. Comprehensive bolting integrity programs encompass all safety-related programs as delineated by NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants." In addition, comprehensive maintenance for bolting is managed in accordance with EPRI TR-104213, "Bolted Joint Maintenance and Applications Guide." Therefore, by letter dated March 22, 2004, in RAI 3.1.2.4-2, the staff requested that the applicant provide details (and a technical basis) on how it manages the loss of prestress of secondary closure bolting.

In its response to RAI 3.1.2.4-2, dated April 22, 2004, the applicant responded that secondary-side closure bolting is used to secure covers for two 16-inch inner diameter (ID) manways, six 6-inch ID handholes, and four 4-inch ID inspection ports. The bolting used to secure the manway covers is 1.25 inches in diameter, and the bolting used to secure the handhole and inspection port covers is 1 inch in diameter. This secondary-side closure bolting is fabricated from ASME SA-193 Grade B7 alloy steel. The applicant stated that it listed no aging effects for the replacement SG secondary-side closure bolting because its AMR for these components determined that no AERMs exist for these bolts. The applicant explained the technical basis for this conclusion as it relates to the loss of prestress. Work performed as a part of the EPRI MRP indicates that secondary, steady-state creep only occurs for alloy steels when operating temperatures exceed 40 to 50 percent of the melting temperature (in absolute units). A conservative lower bound melting temperature for alloy steels is 2500 °F (2959 °R). The SNC conservatively used 725 °F as the temperature below which no steady-state creep of the alloy steel bolting will occur. The applicant's operating temperatures are below this threshold temperature. The SG secondary-side closures are routinely disassembled to provide access for cleaning and inspection, and no long-term accumulation of creep effects is expected to occur since these closure joints are disassembled and reinstalled periodically.

The applicant stated that leakage at joints is typically associated with improper joint installation, joint design, or gasket effects, not relaxation of the bolting materials. The applicant's procedures for joint installation incorporate industry guidance from EPRI NP-5769, "Good Bolting Practices," and EPRI TR-104213. These procedures provide for the use of proper lubricants and sound bolt torquing practices. However, these procedures are considered to be a part of normal maintenance practices and are not credited as a specific AMP for license renewal. Lastly, the applicant stated that its operating experience with the SGs has not indicated any problems with the loss of prestress in the SG secondary-side closures.

The staff finds that the loss of prestress of secondary closure bolting does not require management, based on the applicant's AMR, because (1) the bolting is subjected to operating temperatures below that for creep and bolting is routinely disassembled, thereby essentially removing the likelihood of long-term accumulation of creep effects, (2) joint installation procedures are a component of maintenance practice, which is managed in accordance with EPRI NP-5769 and EPRI TR-104213, and (3) plant operating history has indicated no loss of secondary closure bolting prestress.

With respect to the channel head and integral primary nozzles, primary inlet and outlet nozzle safe ends, and U-tubes (including welded plugs), the staff finds that the applicant has correctly identified the aging effects of cracking and/or loss of material for these components. The staff based its findings on the known aging effects for these materials exposed to treated and/or borated water environments.

With respect to the feedwater distribution assembly, primary manway covers and disc inserts, tube support plates, flow distribution baffles, and antivibration bars, the staff finds that the applicant has identified the aging effects of cracking and/or loss of material for these components. The staff notes that the applicant credited the Water Chemistry Control Program to manage the aging of these components. In addition, the applicant also credited the Steam Generator Program for the management of cracking and loss of material for the feedwater distribution assembly, tube support plates, flow distribution baffles, and antivibration bars. Therefore, by letter dated March 22, 2004, in RAI 3.1.2.4-3, the staff requested that the applicant provide details (and a technical basis) on how the program credited for the management of cracking and/or loss of material in these SG components will detect cracking and/or loss of material.

In its response to RAI 3.1.2.4-3, in a letter dated April 22, 2004, the applicant responded that the preventive features of the Secondary Water Chemistry Control Program primarily manages the loss of material and cracking within the replacement SG secondary-side components addressed by this RAI (i.e., feedwater distribution assembly, tube support plates, flow distribution baffles, and antivibration bars). For these secondary-side components, the applicant's replacement SGs incorporate improvements in the construction materials to address the degradation issues experienced by the industry. The replacement SGs utilize thermally treated Alloy 690 base metal and Alloy 52/152 weld materials (Alloy 600 materials are prohibited in the replacement SGs). Corrosion-resistant materials (ASME SA-240 Type 405 ferritic stainless steel) were used in the tube support plates and the flow distribution baffle (the support plates in the original SGs were carbon steel). Antivibration bars are also constructed from ASME SA-240 Type 405 ferritic stainless steel. The applicant stated that the feedwater distribution assembly is an elevated feed ring design and consists of a thermally treated Alloy 690 thermal sleeve which transitions to an elevated feedwater distribution ring pipe constructed from alloy steel with spray nozzles in lieu of j-tubes. The spray nozzles are fabricated from thermally treated Alloy 690. Industry experience and research demonstrate the reliability of these materials in the secondary-side environment of the SGs.

The applicant also stated that the its replacement SGs incorporate design improvements to reduce scale buildup and deposition of solids (sludge) within the tube bundle, further reducing the potential for component degradation. The flow distribution baffle increases the flow velocity across the tubesheet surface to limit the low velocity region to the center of the tube bundle near the blowdown intake. The passively operating sludge collector reduces the amount of sludge deposited within the tube bundle. The tube support plates use broached quatrefoil-shaped holes (instead of drilled holes) to improve axial flow and reduce contaminant concentration at the tube-to-tube support interface.

The applicant stated that the response to RAI 3.1.2.4-5 provides the details regarding how its Steam Generator Program manages aging of the feedwater distribution assembly, tube support plates, flow distribution baffles, and antivibration bars. The Steam Generator Program performs an assessment based upon the applicant's SG design, potential degradation mechanisms, and related FNP and industry operating experience to establish inspection requirements for secondary-side internals components. The FNP-specific operating experience includes results from previous inspections and observations made during cleaning activities (e.g., sludge lancing and sludge collector cleaning). Where appropriate based on the conclusions of this assessment, the applicant may perform visual inspections to detect component degradation. The applicant stated that it credits the preventive actions of the Water Chemistry Control Program for aging management of the primary manway covers and disc inserts in the borated water environment. The Water Chemistry Control Program provides for both a strongly reducing environment via the addition of oxygen scavengers and strict control of detrimental ionic species. By design, only the disc inserts are exposed to the primary water environment. These disc inserts are fabricated from ASME SA-240, Grade 304 austenitic stainless steel plate and are held in place by stainless steel screws. These inserts were heat treated after machining and are not field welded, thus eliminating sensitization issues. The applicant has detected no evidence of age-related degradation of the primary manway disc inserts or covers in the operating experience to date. In addition, the applicant periodically removes the primary manway covers and disc inserts in support of SG primary-side activities (e.g., ECT of the SG tubes). Their condition is visually assessed as part of these normal activities.

On the basis of the information submitted, the staff concludes that the applicant's Secondary Water Chemistry Control Program and Steam Generator Program are adequate to detect cracking and/or loss of material for the replacement SG components because of (1) the use of materials with improved corrosion resistence, according to plant and industry experience and industry research, (2) improved design of replacement SG internal assemblies, and (3) the effectiveness of the Water Chemistry Program in preventing age-related degradation of these components.

With respect to the feedwater inlet nozzle, secondary shell penetrations, upper head with integral steam nozzles, upper shells, lower shells, and transition cones, the staff notes that one of the environments listed in LRA Table 3.1.2-4 is the inside environment (i.e., exterior surfaces inside the containment structure). The staff also notes that no AERMs are listed for these components. The GALL AMP XI.M10, “Boric Acid Corrosion,” states that the program includes any carbon steel and low-alloy steel structure or component on which borated water may leak. In light of recent events at Davis-Besse that involved the leakage of borated coolant water and the subsequent corrosion of a ferrous component, by letter dated March 22, 2004, in RAI 3.1.3.4-4, the staff requested that the applicant discuss why it did not list the loss of material due to borated water leakage as an AERM. The staff also asked the applicant to describe the program credited for managing borated water leakage and corrosion of the exterior surfaces for these SG components.

In its response to RAI 3.1.3.4-4, dated April 22, 2004, the applicant responded that its replacement SG upper head with integral steam nozzle, upper shell, transition cone, lower shell, and feedwater inlet nozzle are not subject to borated water leakage because they are not located beneath any potential source of borated water leakage and are physically separated from the primary manways. There are no borated water pipelines routed above the SG cubicles. The applicant’s replacement SG primary manways are located on the underside of the lower channel head. Any borated water leakage from the primary manways would either remain on the lower head or would drip downward, away from the subject SG subcomponents. Therefore, boric acid corrosion is not considered plausible for these SG subcomponents. This SNC position is consistent with NUREG-1801, Volume 2, Section IV.D1. Within this section of NUREG-1801, only the SG lower head and primary manway component types are associated with boric acid corrosion. Although NUREG-1801 includes steam generator upper heads, shells, transition cones, and feedwater nozzles, these component types are not associated with boric acid corrosion.

Recent operating experience at another PWR facility (Catawba) showed cracking in a SG drain lines on the bottom of the SGs. These were 1/4 inch drain lines used to drain water out during plant outages. The FNP SGs do not have separate bowl drains like Catawba which exhibited cracking. On the Farley SGs, the bowl drains were replaced with a small hole drilled through the lip of the nozzles such that the bowl drains into the hot and cold legs on either side of the SG. Therefore, the potential for bowl drain line cracking does not apply to FNP.

On the basis of the information submitted, the staff concludes that it is appropriate not to list the loss of material due to borated water leakage as an AERM for the upper head with integral steam nozzle, upper shell, transition cone, lower shell, and feedwater inlet nozzle in the FNP SGs.

<u>Conclusion</u>

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.3 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that the aging effects associated with the reactor vessel, internals, RCS components, ans steam generators will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging of the reactor vessel, internals, and RCS components, as required by 10 CFR 54.21(d).

3.2 Aging Management of Engineered Safety Features Systems

This section of the SER documents the staff's review of the applicant's AMR results for the engineered safety features system components and component groups associated with the following systems:

- containment spray
- containment isolation
- emergency core cooling
-

3.2.1 Summary of Technical Information in the Application

In Table 3.2.1, "Summary of the Aging Management Evaluations for Engineered Safety Features in Chapter V of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the engineered safety features system components and component groups that are relied on for license renewal.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report in 2001.

The applicant conducts its ongoing review of plant-specific and industry operating experience in accordance with the FNP, Units 1 and 2, Operating Experience Program.

3.2.2 Staff Evaluation

The staff reviewed LRA Section 3.2 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the engineered safety features system components that are within the scope of license renewal and subject to an AMR 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 performed an audit and review to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report. However, the staff did determine that the applicant presented applicable material in the LRA and identified the appropriate GALL AMPs. Section 3.0.3 of this SER documents the staff's evaluations of these AMPs. The FNP Audit and Review Report, summarized in Section 3.2.2.1 of this SER, documents the details of the staff's evaluation of the audit and review for these AMRs.

The staff also performed an audit and review of those AMRs that were consistent with the GALL Report and for which further evaluation is recommended. During the audit and review, the staff evaluated that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.2.2.2 of the SRP-LR. The FNP Audit and Review Report, summarized in Section 3.2.2.2 of this SER, documents the details of the staff's evaluation of the audit and review for these AMRs.

The staff conducted a technical review of the remaining AMRs that were not consistent with the GALL Report. In the review, the staff evaluated whether the applicant identified all plausible aging effects and listed the appropriate aging effects for the material-environment combinations specified. Section 3.2.2.3 of this SER documents the details of the staff's review and evaluation of these AMRs that are not consistent with the GALL Report.

Finally, the staff reviewed the AMP summary descriptions in the FSAR Supplement to ensure that they adequately describe the programs credited with managing or monitoring aging for the engineered safety system components.

Table 3.2-1 below summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in Section 3.2 of the LRA and addressed by the GALL Report.

Table 3.2-1 Staff Evaluation for Engineered Safety Features System Components in the GALL Report

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Piping, fittings, and valves in emergency core cooling system **Item Number 3.2.1-1**	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	10 CFR 54.21 (c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.2.2.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems **Item Number 3.2.1-3**	Loss of material due to general corrosion	Plant specific	One-Time Inspection Program (Appendix B.5.5); External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends further evaluation. (See Section 3.2.2.2.2)
Components in containment spray (PWR only), standby (BWR only), containment isolation, and emergency core cooling systems **Item Number 3.2.1-5**	Loss of material due to pitting and crevice corrosion	Plant specific	One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.2.2.2.3)
Containment isolation valves and associated piping **Item Number 3.2.1-6**	Loss of material due to MIC	Plant specific	None	Consistent with GALL, which recommends further evaluation. (See Section 3.2.2.2.4)
High-pressure safety injection (charging) pump miniflow orifice **Item Number 3.2.1-8**	Loss of material due to erosion	Plant specific	One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.2.2.2.6)
External surfaces of carbon steel components **Item Number 3.2.1-10**	Loss of material due to general corrosion	Plant specific	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends further evaluation. (See Section 3.2.2.2.2)
Piping and fittings of CASS in emergency core cooling systems **Item Number 3.2.1-11**	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.2.2.1)
Components serviced by open-cycle cooling system **Item Number 3.2.1-12**	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	OCCW system	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.2.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components serviced by closed-cycle cooling system **Item Number 3.2.1-13**	Loss of material due to general, pitting, and crevice corrosion	CCCW system	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.2.2.1)
Pumps, valves, piping, fittings, and tanks in containment spray and emergency core cooling systems **Item Number 3.2.1-15**	Crack initiation and growth due to SCC	Water chemistry	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.2.2.1)
Carbon steel components **Item Number 3.2.1-17**	Loss of material due to boric acid corrosion	Boric acid corrosion	Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.2.2.1)
Closure bolting in high-pressure or high-temperature systems **Item Number 3.2.1-18**	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.2.2.1)

The staff's review of the applicant's engineered safety features system and associated components followed one of several approaches. One approach, documented in Section 3.2.2.1, involved the staff's review of the AMR results for components in the engineered safety features system that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in Section 3.2.2.2, involved the staff's review of the AMR results for components in the engineered safety features system that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in Section 3.2.2.3, involved the staff's review of the AMR results for components in the engineered safety features system that the applicant indicated are not consistent with the GALL Report or are not addressed in the GALL Report. Section 3.0.3 of this SER documents the staff's review of AMPs that are credited to manage or monitor aging effects of the engineered safety features system components.

3.2.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Not Recommended

Summary of Technical Information in the Application

In Sections 3.2.2.1.1 through 3.2.2.1.3 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the engineered safety features system components:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

Staff Evaluation

In Tables 3.2.2-1 through 3.2.2-3 of the LRA, the applicant summarized the AMRs for the engineered safety features systems and identified which AMRs it considered to be consistent with the GALL Report.

The staff conducted an audit and review of the LRA and program bases documents, which are available at the applicant's engineering office. On the basis of its audit and review, the staff finds that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with GALL. Therefore, the staff finds that the applicant identified applicable aging effects that are appropriate for the material-environment combinations listed.

On the basis of its audit and review, 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).

Conclusion

The staff has evaluated the applicant's claim of consistency with the GALL Report. The staff reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Recommended

Summary of Technical Information in the Application

In Section 3.2.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for engineered safety features systems. The applicant discussed how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general corrosion
- local loss of material due to pitting and crevice corrosion
- local loss of material due to microbiologically influenced corrosion
- changes in material properties due to elastomer degradation
- local loss of material due to erosion
- buildup of deposits due to corrosion

Staff Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's analysis to determine whether it adequately addressed these issues. In addition, the staff audited the applicant's further evaluations against the criteria contained in Section 3.2.2.2 of the SRP-LR. The FNP Audit and Review Report documents the details of the staff's audit and review.

The GALL Report indicates that further evaluation should be performed for the aging effects described in the following sections.

3.2.2.2.1 Cumulative Fatigue Damage

As stated in the SRP-LR, fatigue is a TLAA, as defined in 10 CFR 54.3, and TLAAs must be evaluated in accordance with 10 CFR 54.21(c)(1). Section 4.3 of this SER documents the staff's review of the applicant's evaluation of this TLAA. In performing this review, the staff followed the guidance in Section 4.3 of the SRP-LR.

3.2.2.2.2 Loss of Material Due to General Corrosion

In Section 3.2.2.2.2 of the LRA, the applicant addressed the loss of material due to general corrosion that could occur in the containment isolation and emergency core cooling systems, as well as on the external surfaces of carbon steel components.

Section 3.2.2.2.2 of the SRP-LR states that the loss of material due to general corrosion could occur in the containment spray and emergency core cooling systems, as well as on the external surfaces of carbon steel components. The GALL Report recommends further evaluation on a plant-specific basis to ensure that the aging effect is adequately managed.

The applicant stated that the scope of components addressed by this discussion includes carbon steel components in the emergency core cooling and containment isolation systems. The containment spray system does not contain carbon (or low-alloy) steel components except for bolting and encapsulation vessels. The applicant credited the One-Time Inspection Program (AMP B.5.5) for carbon steel components in an air/gas (wetted) environment and the External Surfaces Monitoring Program (AMP B.5.3) for the loss of material due to general corrosion for the external surfaces of carbon steel components and bolting.

Sections 3.0.3.1 and 3.0.3.3.2 of this SER document the staff's review of the One-Time Inspection Program and the External Surfaces Monitoring Program, respectively. The One-Time Inspection Program covers components from these systems, and the program is consistent with GALL AMP XI.M33, "Selective Leaching of Materials." The scope of the External Surfaces Monitoring Program includes components from these systems and depends on visual inspection to detect degradation. The staff concludes that the plant-specific program credited by the applicant for this line item is acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving the management of the loss of material due to general corrosion, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds 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).

3.2.2.2.3 Local Loss of Material Due to Pitting and Crevice Corrosion

In Section 3.2.2.2.3 of the LRA, the applicant addressed the local loss of material due to pitting and crevice corrosion that could occur in the interior and exterior surfaces of the carbon steel and stainless steel components in the containment isolation system and on the outer surface of the stainless steel refueling water storage tank.

Section 3.2.2.2.3 of the SRP-LR states that the local loss of material from pitting and crevice corrosion could occur in the containment spray components, containment isolation valves and associated piping, and the buried portion of the refueling water tank's external surface. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The applicant stated that the environments in the containment isolation system are dry gas and air/gas (wetted). In addition, the applicant stated that component surfaces exposed to a dry gas environment do not need aging management for the local loss of material due to pitting and crevice corrosion. For components in the containment isolation system with an air/gas environment, the applicant credited the One-Time Inspection Program (AMP B.5.5) with managing the aging effect of a loss of material due to pitting and crevice corrosion.

Section 3.0.3.1 of this SER documents the staff's review of the One-Time Inspection Program. The staff concludes that the plant-specific program credited by the applicant for this line item is acceptable.

The applicant stated that the stainless steel refueling water storage tank is located above the ground; therefore, this aging mechanism does not apply. The staff concurs with this conclusion.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving the management of the local loss of material due to pitting and crevice corrosion, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds 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).

3.2.2.2.4 Local Loss of Material Due to Microbiologically Influenced Corrosion

In Section 3.2.2.2.4 of the LRA, the applicant addressed the local loss of material due to MIC.

Section 3.2.2.2.4 of the SRP-LR states that the local loss of material due to MIC could occur in containment isolation valves and associated piping in systems that other chapters of the GALL Report do not address. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The applicant stated that it addressed the containment isolation system components that have an environment of treated water, raw water, or liquid waste as part of other systems. The components applicable to this line item include those with exposure to a dry gas or an air/gas (wetted) environment. For these environments, the loss of material due to MIC is not a valid aging effect.

Because microbiological organisms need a water environment, and because the components are exposed to a dry gas or an air/gas environment, the staff finds that this aging effect does not apply to FNP.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving the management of the local loss of material due to MIC, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds 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).

3.2.2.2.5 Changes in Material Properties Due to Elastomer Degradation

The applicant stated that this issue applies only to BWRs; therefore, it does not apply to FNP. The staff concurs with this assessment.

3.2.2.2.6 Local Loss of Material Due to Erosion

In Section 3.2.2.2.6 of the LRA, the applicant addressed the local loss of material due to erosion that could occur in the high-pressure safety injection pump miniflow orifice.

Section 3.2.2.2.6 of the SRP-LR states that a local loss of material due to erosion could occur in the high-pressure safety injection pump miniflow orifice. This aging mechanism and its effect will apply only to pumps that are normally used as charging pumps in the chemical and volume control system. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The applicant stated that this aging mechanism and effect will apply only to pumps that are normally used as charging pumps in the chemical and volume control systems. The applicant credited the One-Time Inspection Program (AMP B.5.5) as the plant-specific program that will manage this aging effect. The applicant stated that the six pumps are rotated to equalize run time, so each miniflow orifice is susceptible to this aging effect in a similar manner. The one-time inspection will be performed on a bounding CVCS letdown orifice or charging/SI pump miniflow orifice, which would be a good indicator for all the others.

Section 3.0.3.1 of this SER documents the staff's review of the One-Time Inspection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving the management of the loss of material due to erosion, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds 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).

3.2.2.2.7 Buildup of Deposits Due to Corrosion

The applicant stated that this issue applies only to BWRs; therefore, it does not apply to FNP.

The staff concurs with this assessment.

Conclusion

On the basis of its audit and review, the staff finds that the applicant’s further evaluations conducted in accordance with the GALL Report are consistent with the acceptance criteria in Section 3.2.2.2 of the SRP-LR. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

3.2.2.3.1 Containment Spray System AMR Results

Summary of Technical Information in the Application

In Section 3.2.2.1.1 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the AERMs for the containment spray system components:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.2.2-1 of the LRA, the applicant summarized the AMRs for the containment spray system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the containment spray system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.2.2-1. Section 3.2.2.1 of this SER documents the staff’s evaluation.

The technical staff reviewed the AMR of the combinations of containment spray system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.2.2-1. For the combinations using notes F through J, the staff determined that the applicant identified all applicable AERMs and credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.2.1 of the LRA lists individual system components for the containment spray system within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include eductors, encapsulation vessel, flow orifice, flow element, piping, pump casings, spray nozzles, valve bodies, and vortex breakers.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Stainless steel components exposed to borated water and wetted air/gas environments are subject to the aging effect of loss of material.

- Carbon steel components exposed to air/gas or inside environments are subject to the aging effect of loss of material.

- Stainless steel components exposed to air/gas, inside, or embedded environments experience no aging effects.

During its review, the staff determined that it needed additional information to complete its evaluation of the containment spray system. Section 3.2.2.3.4.1 of this SER contains the staff's evaluation of the loss of material for stainless steel and stainless steel clad components in a borated water environment. Section 3.2.2.3.4.2 of this SER provides the staff's evaluation of the loss of preload and cracking for closure bolting.

On the basis of its review of the LRA, the staff finds that the aging effects of the containment spray system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.2.2-1 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the containment spray system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.2.2-1 of the LRA identifies the following AMPs for managing the aging effects described above for the containment spray system:

- Water Chemistry Control Program (LRA Section B.3.2)
- One-Time Inspection Program (LRA Section B.5.5)

Sections 3.0.3.2.1 and 3.0.3.1, respectively, of this SER provide the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the containment spray system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the containment spray system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.2.2.3.2 Containment Isolation System AMR Results

Summary of Technical Information in the Application

In Section 3.2.2.1.2 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the containment isolation system components:

- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.2.2-2 of the LRA, the applicant summarized the AMRs for the containment isolation system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the containment isolation system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.2.2-2. Section 3.2.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMR of the combinations of containment isolation system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.2.2-2. For the combinations using notes F through J, the staff determined that the applicant identified all applicable AERMs and credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.2-2 of the LRA lists individual system components for the containment isolation system that are within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for AMR include capillary tubing, piping, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Carbon steel components exposed to an air/gas environment are subject to the aging effect of loss of material.

- Carbon steel components exposed to a dry gas environment experience no aging effects.

- Stainless steel components exposed to air/gas, dry gas, and inside environments experience no aging effects.

During its review, the staff determined that it needed additional information to complete its evaluation of the containment isolation system. Section 3.2.2.3.4.2 of this SER contains the staff's evaluation of the loss of preload and cracking for closure bolting.

Table 3.2.2-2 of the LRA does not list the material type for valve bodies located in an inside environment. In RAI 3.2-1, the staff requested the material type for these valve bodies. In its response dated May 28, 2004, the applicant's errata sheet for the LRA listed the material type for the valve bodies as stainless steel. The staff considers this material type acceptable for the aging management identified in the LRA.

On the basis of its review of the LRA, the staff finds that the aging effects of the containment isolation system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.2.2-2 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the containment isolation system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.2.2-2 of the LRA identifies the following AMPs for managing the aging effects described above for the containment isolation system:

- Water Chemistry Control Program (LRA Section B.3.2)
- One-Time Inspection Program (LRA Section B.5.5)

Sections 3.0.3.2.1 and 3.0.3.1, respectively, of this SER provide the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the containment isolation system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the containment isolation system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they provide an adequate description of the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.2.2.3.3 Emergency Core Cooling System AMR Results

Summary of Technical Information in the Application

In Section 3.2.2.1.3 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the emergency core cooling system components:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.2.2-3 of the LRA, the applicant summarized the AMRs for the emergency core cooling system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the emergency core cooling system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.2.2-3. Section 3.2.2.1 of this SER documents the staff’s evaluation.

The technical staff reviewed the AMR of the combinations of emergency core cooling system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.2.2-3. For the combinations using notes F through J, the staff determined that the applicant identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

During the scoping review, in response to NRC Inspection Report Nos. 50-348/2004-007 and 50-364/2004-007, dated June 22, 2004, the applicant added vents for the refueling water storage tank within the scope of license renewal. The vents are considered an integral subpart of the tank and consequently are part of the refueling water storage tank (RWST) listed in LRA

Table 3.2.2-3. The applicant stated that the aging effect for the stainless steel vents in an air/gas (wetted) environment is loss of material, and that this aging effect will be managed by the One-Time Inspection Program.

By letter dated August 31, 2004 (SNC Letter No. NL-04-1594), the applicant added aging management for the charging/high head safety injections (HHSI) pump casings. The pump casings are carbon steel with stainless steel clad and the intended function is pressure boundary. The applicant identified loss of material as the aging effect (base metal corrosion due to clad cracking), and that this aging effect will be managed by the Periodic Surveillance and Preventive Maintenance Activities.

Aging Effects

Table 2.3.2.3 of the LRA lists individual system components for the emergency core cooling system that are within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for AMR include charging/safety injection miniflow orifices; encapsulation vessel; flow orifices and elements; residual heat removal heat exchanger channel heads, tubesheets, and tubes; high-head safety injection pump oil cooler shell, channel head, and tubes; piping; high-head and residual heat removal pump casings; safety injection accumulators; refueling water storage tank; valve bodies; and vortex breakers.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Stainless steel and stainless steel clad components exposed to a borated water environment are subject to the aging effect of loss of material.

- Stainless steel residual heat removal heat exchanger tubes exposed to a closed-cycle cooling water (CCCW) environment are subject to the aging effect of cracking.

- Copper high-head safety injection oil cooler tubes exposed to a CCCW environment are subject to the aging effect of loss of material.

- Carbon steel components exposed to an air/gas environment are subject to the aging effect of loss of material.

- Carbon steel components exposed to a dry gas environment experience no aging effects.

- Stainless steel components exposed to air/gas, dry gas, embedded, inside, and outside environments experience no aging effects.

- Carbon steel and copper alloy components exposed to a lube oil environment experience no aging effects.

- Carbon steel with stainless steel clad pump casings exposed to a borated water environment are subject to loss of material (base metal corrosion due to clad cracking).

- Cast iron high-head safety injection oil cooler channel heads exposed to a CCCW environment are subject to the aging effect of loss of material.

During its review, the staff determined that it needed additional information to complete its evaluation of the emergency core cooling system. Section 3.2.2.3.4.1 of this SER contains the staff's evaluation of the loss of material for stainless steel and stainless steel clad components in a borated water environment. Section 3.2.2.3.4.2 of this SER contains the staff's evaluation of the loss of preload and cracking for closure bolting.

Table 3.2.2-3 of the LRA states that the applicant did not determine the loss of material in an oil environment to be an AERM for the carbon steel oil cooler shell and the copper alloy tubes for the high-head safety injection pump in the emergency core cooling system. The GALL Report recommends a plant-specific AMP for the loss of material due to general, pitting, and crevice corrosion and MIC in carbon steel components exposed to lubricating oil that may be contaminated with water. Similar aging effects (except general corrosion) are possible for copper alloy. In RAI 3.2-2, the staff asked the applicant to justify not managing the aging effect of the loss of material due to general, pitting, and crevice corrosion and MIC for the high-head safety injection pump components. In its response dated March 5, 2004, the applicant stated that the lubricating oil systems are typically closed systems, and tube failure is not assumed because the cooling water side of the tubes is managed for aging. Therefore, the lubricating oil is assumed to be free of water contamination. Significant corrosion is only expected where water can settle or pool. Since water contamination is not expected, settling or pooling should not occur; therefore, the lubricating oil systems are not susceptible to the loss of material due to general, pitting, and crevice corrosion or MIC. The applicant stated that its operating experience supports this conclusion. Although not credited for license renewal, the operators visually check the oil levels for the high safety injection/charging pumps every shift for the proper level and visual evidence of contamination. The oil is sampled every 6 months and is changed based on the results of the sample analysis. The applicant also checks the oil levels and conditions during quarterly pump surveillance testing. Based on the applicant's response that water settling or pooling is not expected, and because the operating experience at FNP supports this conclusion, the staff concurs that the loss of material in the lubricating oil coolers is not an AERM.

In RAI 3.2-3, the staff asked the applicant if it considered selective leaching to be an aging mechanism for the copper alloy oil cooler tubes for the high-head safety injection pump. In its response dated March 5, 2004, the applicant stated that it did not consider the oil cooler tubes to be susceptible to selective leaching. These tubes are fabricated from admiralty brass, which inhibits or increases resistance to selective leaching. In the nonaggressive lubricating oil and CCCW environment, selective leaching is not expected to be a significant degradation mechanism for admiralty brass. The aging mechanisms for the oil cooler tubes are pitting, crevice corrosion, and MIC, which are managed by the Water Chemistry Control Program and the One-Time Inspection Program, as identified in LRA Table 3.2.2-3. Based on the applicant's response, the staff concurs that selective leaching is not an AERM for the high-head safety injection pump oil cooler tubes.

In RAI 3.2-5, the staff requested the applicant to justify its use of the One-Time Inspection Program to manage the loss of material for the carbon steel encapsulation vessel in an air/gas (wetted) environment. Section 3.0.4 of the LRA defines an air/gas (wetted) environment as containing significant amounts of moisture where condensation or water pooling may occur. In its response dated March 5, 2004, the applicant stated that LRA Table 3.2.2-3 incorrectly shows the internal environment of the encapsulation vessel. The correct internal environment is air/gas, which is defined as containing air that is similar in temperature and moisture content to ambient air conditions located throughout the plant, with no significant condensation expected. The internal air/gas and gas environment of the encapsulation vessel is stagnant and at the same temperature as the surroundings, such that condensation is not expected. Thus, no significant amounts of moisture are available where condensation or water pooling could occur. Based on the applicant's response, the staff considers the One-Time Inspection Program acceptable to manage the loss of material for the carbon steel encapsulation vessel in an air/gas environment.

Table 3.2.2-3 of the LRA lists the loss of material and cracking, but not erosion, as AERMs for the flow orifice/element. In RAI 3.2-6, the staff requested the applicant to describe the flow orifice/element, its location in the system, and why it did not consider erosion to be an AERM. In its response dated March 5, 2004, the applicant stated that FNP uses the stainless steel flat-plate orifices for both flow measurement and flow restriction, and the orifices do not experience significant pressure drops. These plates are located in various locations, such as downstream of the high-pressure coolant injection pumps for flow instrumentation. Revision 3 to EPRI TR-1003056, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," issued November 2001, states the following:

> Material loss because of erosion is possible only if the fluid contains particulates in the fluid stream that impinges upon the surface of the metal. Treated water chemistry and filtration requirements typically preclude the buildup of particulates that could contribute to abrasive erosion of carbon steel, low-alloy, wrought austenitic stainless steel, cast iron, CASS, copper alloys, and nickel-based alloys.

Stainless steel materials are not generally susceptible to any form of erosion, erosion-corrosion, or FAC in a borated water environment. Even without chemistry controls, the closed nature of the system and the tightly adherent oxide layers formed by these austenitic materials preclude the possibility of any significant erosion of the material. Therefore, FNP does not consider erosion of these stainless steel flat-plate orifices an AERM. Based on the applicant's response, the staff does not consider erosion an AERM for the stainless steel flat-plate orifices.

On the basis of its review of the LRA, the staff finds the aging effects of the emergency core cooling system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.2.2-3 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the emergency core cooling system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-3 of the LRA identifies the following AMPs for managing the aging effects described above for the emergency core cooling system:

- Water Chemistry Control Program (LRA Section B.3.2)
- One-Time Inspection Program (LRA Section B.5.5)
- Periodic Surveillance and Preventive Maintenance Activities (LRA Section B.5.9)

Sections 3.0.3.2.1, 3.0.3.1, and 3.0.3.3.4, respectively, of this SER provide the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the emergency core cooling system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the emergency core cooling system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.2.2.3.4 Generic Issues for the Engineered Safety Features

3.2.2.3.4.1 Stainless Steel Components in Borated Water Environment. In RAI 3.2-4, the staff requested the applicant to explain why it will not perform a one-time inspection to determine the effectiveness of the Water Chemistry Control Program for stainless steel components in a borated water environment. In its response dated March 5, 2004, the applicant stated that localized corrosion of stainless steels is not a long-term, linearly progressive process like general corrosion of carbon steels. Stainless steels derive their corrosion resistance from the thin, tightly adherent, passive chromium oxide layer that forms at the components' surface. If the environmental conditions are not sufficiently aggressive to penetrate this oxide layer, then no significant corrosion is expected to result. For austenitic stainless steels, penetration of the passive chromium oxide layer and subsequent corrosion has been shown to be related principally to the oxidizing nature of the environment and the presence of specific detrimental ionic species know to interfere with the passivation process, most notably chlorides, sulfates, and fluorides. According to EPRI TR-1003056, localized corrosion of stainless steels exposed to borated water is not a significant concern when dissolved oxygen concentrations are less than 100 ppb and concentrations of detrimental ionic species are less than 150 ppb. The FNP Water Chemistry Control Program limits both dissolved oxygen and detrimental ionic species concentrations to values well below those specified by these limits. Experience both at FNP and throughout the industry confirm that pitting and crevice corrosion have not been an issue of concern for these materials and environments. Based on the applicant's response, the Water Chemistry Control Program is acceptable to manage the aging effects for stainless steel components in a borated water environment.

3.2.2.3.4.2 Cracking and Loss of Preload for Bolting Components. The GALL bolting Integrity program, described in Section XI-M18, addresses the aging effects of cracking and loss of preload (stress relaxation) for closure bolting. Cracking is considered an AERM for carbon and alloy steel bolts with an actual yield strength for the material that is equal to or greater than 150 ksi. Stress relaxation is considered an AERM for bolts in a high-temperature environment. Tables 3.2.2, 3.3.2, and 3.4.2 of the LRA do not address cracking or stress relaxation for these conditions. In RAI 3.2-7 dated April 8, 2004, the staff asked the applicant if any bolting in the engineered safety features, auxiliary systems, or steam and power conversion systems require aging management for the aging effects of cracking and loss of preload (stress relaxation). In its response dated May 5, 2004, the applicant stated the following:

> The aging management reviews for the engineered safety features (ESF), auxiliary, and steam and power conversion (S&PC) systems at FNP determined that cracking of high strength bolting and loss of preload due to stress relaxation of bolting are not aging effects requiring management at FNP and no aging management program needs to be credited. The mechanism of concern for cracking for high strength bolts is stress corrosion cracking (SCC). The bases for these conclusions are outlined below.
>
> <u>SCC of High Strength Bolting</u>
>
> For the ESF, auxiliary, and S&PC systems, the bolts identified as having the potential for an actual yield strength that may be equal to or greater than 150 ksi are ASME SA-193/ASTM A193 Grade B7 bolts. These bolts have a minimum specified yield strength of 105 ksi, however no maximum yield strength is specified for this material. Therefore, the actual yield strength for these bolts could exceed 150 ksi.
>
> Although there have been isolated instances of SCC of bolting in the industry, these failures have been attributed primarily to high yield stress materials (including abnormally high yield stresses resulting from improper heat treatment), excessive bolt preload, and contaminants, such as the use of thread lubricants containing molybdenum sulfide (MoS_2). A review of industry failure databases and NRC generic communications supports the fact that a combination of material selection, control of contaminants, and proper maintenance and torquing procedures is effective in eliminating the potential for SCC of bolting materials. These practices are in place at FNP as discussed below.
>
> Material Selection—EPRI NP-5769, "Degradation of Bolting in Nuclear Power Plants," April 1988 indicates that susceptibility to SCC is minimized through selection of materials having specified minimum yield strengths less than 150 ksi. The ESF, auxiliary and S&PC systems bolting materials meet this criteria. ASME SA-193/ASTM A193 Grade B7 bolts have a minimum specified yield strength of 105 ksi, which is below the recommended value of 150 ksi.
>
> Control of Contaminants—In general, environmental conditions that could lead to SCC of bolting are not expected to occur in non-Class 1 components. Most bolting at FNP is normally in a dry environment and coated with a lubricant. For bolting located outdoors, the atmosphere is mild in terms of corrosive contaminants (rural environment and remote from coastal regions). Rain tends to wash off contaminants instead of concentrating them. Within the industry, SCC failures of quenched and tempered alloy steel bolting, such as SA-193 Grade B7 bolts, have many times been associated with the use of lubricants that may decompose into SCC-inducing contaminants, most notably MoS_2. FNP has not used lubricants containing MoS_2 and procedural controls are in place at FNP to prevent the use of lubricants containing potentially detrimental species such as chlorides and sulfates.
>
> Control of Bolt Preload—Excessive bolt stresses have resulted in SCC failures in the industry. Proper control of bolt preload through sound bolt torquing practices has been shown to prevent excessive preload and thereby minimize the potential for SCC failures. At FNP, procedural controls are in place to assure that proper bolt torquing practices are used.
>
> The potential for SCC of bolting materials has been addressed at FNP in response to several industry communications including NRC IE Bulletin 82-02, INPO SOER 84-5, and EPRI guidance

documents. The bolting materials used, lubricant/contaminant controls, and sound bolt torquing practices have been effective at eliminating this aging effect. A review of recent FNP operating history performed for development of the FNP LRA did not identify any instances of SCC in engineered safety features systems, auxiliary systems, and steam and power conversion systems bolting which includes ASTM SA-193/ASTM A193 Grade B7 fasteners. Additionally, a review of recent NRC generic communications did not identify any recent bolting failures attributable to SCC.

Therefore, cracking due to SCC is not an aging effect requiring management for the carbon steel and alloy steel bolting materials used in FNP engineered safety features systems, auxiliary systems, and steam and power conversion systems.

Loss of Preload Due to Stress Relaxation of Bolting Materials

SNC has determined that loss of preload (stress relaxation) in bolted connections is not an aging effect requiring management for the engineered safety features systems, auxiliary systems, and steam and power conversion systems at FNP.

Work performed as a part of the EPRI Material Reliability Program indicates that secondary, steady-state, creep only occurs for alloy steels when operating temperatures exceed 40% to 50% of the melting temperature (in absolute units). A conservative lower bound melting temperature for steel bolting materials is 2500 °F (2959 °R). Accordingly, SNC concludes that no steady-state creep of bolting will occur at operating temperatures below 725 °F. The FNP operating temperatures in the engineered safety features systems, auxiliary systems, and steam and power conversion systems are below this threshold temperature.

Leakage at joints is typically associated with improper joint installation (e.g., proper cleanliness, gasketing, and preload) or inadequate joint design, not relaxation of the bolting materials. FNP procedures for joint installation incorporate industry guidance from EPRI NP-5769, *Good Bolting Practices*, and EPRI TR-104213, *Bolted Joint Maintenance and Application Guide*. These procedures provide for the use of proper lubricants and sound bolt torquing practices. However, these procedures are considered to be a part of normal maintenance practices and are not credited as a specific aging management program for license renewal.

Lastly, FNP operating experience has not indicated any problems with loss of preload due to stress relaxation in bolted closures.

Based on this information, SNC maintains that loss of preload due to stress relaxation is not an aging effect requiring management for bolted connections in the engineered safety features systems, auxiliary systems, and steam and power conversion systems at FNP.

The staff considers the applicant’s response satisfactory to address SCC for high-strength bolts and loss of preload due to stress relaxation for the engineered safety feature, steam and power conversion, and auxiliary systems. High-strength bolts do not require aging management for SCC, based on bolting material selection and industry bolting practices. The loss of preload due to stress relaxation does not require aging management based on system operating temperatures and industry bolting practices.

3.2.3 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that the aging effects associated with the engineered safety feature systems components will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging of the engineered safety feature systems, as required by 10 CFR 54.21(d).

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 system components and component groups associated with the following systems:

- new fuel storage
- spent fuel storage
- spent fuel pool cooling and cleanup
- overhead heavy and refueling load handling
- open-cycle cooling water
- closed-cycle cooling water
- compressed air
- chemical and volume control
- control room area ventilation
- auxiliary and radwaste area ventilation
- primary containment ventilation
- yard structures ventilation
- fire protection
- diesel fuel oil
- emergency diesel generator
- demineralized water
- high-energy line break detection
- hydrogen control
- liquid waste and drains
- oil-static cable pressurization
- potable and sanitary water
- radiation monitoring
- reactor makeup water storage
- sampling

3.3.1 Summary of Technical Information in the Application

In LRA Table 3.3.1, "Summary of the Aging Management Evaluations for Auxiliary Systems in Chapter VII of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the auxiliary system components and component groups that are relied on for license renewal.

The applicant's AMRs incorporated operating experience applicable to the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report in 2001.

The applicant conducts its ongoing review of plant-specific and industry operating experience in accordance with the FNP, Units 1 and 2, Operating Experience Program.

3.3.2 Staff Evaluation

The staff reviewed Section 3.3 of the LRA to determine if the applicant had provided sufficient information to demonstrate that the effects of aging on the auxiliary system components that are within the scope of license renewal and subject to an AMR 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 performed an audit and review to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report. However, the staff did determine that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMPs. The staff documented its evaluations of the AMPs in Section 3.0.3 of this SER. The FNP Audit and Review Report provides details of the staff's audit and review for these AMRs.

The staff also performed an audit and review of those AMRs that were consistent with the GALL Report and for which GALL recommends further evaluation. During the audit, the staff determined that the applicant's additional evaluations were consistent with the acceptance criteria in Section 3.3.2.2 of the SRP-LR. The FNP Audit and Review Report, as summarized in Section 3.3.2.2 of this SER, details the staff's audit and review of these AMRs.

The staff conducted a technical review of the remaining AMRs that were not consistent with the GALL Report. The review included evaluating whether the applicant identified all plausible aging effects that were appropriate for the material-environment combinations specified. Section 3.3.2.3 of this SER documents the details of the staff's review and evaluation for these AMRs that are not consistent with the GALL Report.

Finally, the staff reviewed the AMP summaries in the FSAR Supplement to ensure that they adequately describe the programs credited with managing or monitoring aging for the reactor system components.

Table 3.3-1 below summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in Section 3.3 of the LRA that are addressed in the GALL Report.

Table 3.3-1 Staff Evaluation for Auxiliary System Components in the GALL Report

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in spent fuel pool cooling and cleanup **Item Number 3.3.1-1**	Loss of material due to general, pitting, and crevice corrosion	Water chemistry and one-time inspection	None	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems **Item Number 3.3.1-2**	Hardening, cracking, and loss of strength due to elastomer degradation; loss of material due to wear	Plant specific	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.2)
Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR) **Item Number 3.3.1-3**	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.3)
Heat exchangers in reactor water cleanup system (BWR); high-pressure pumps in chemical and volume control system (PWR) **Item Number 3.3.1-4**	Crack initiation and growth due to SCC or cracking	Plant specific	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.4)
Components in ventilation system, diesel fuel oil system, and emergency diesel generator systems; external surfaces of carbon steel components **Item Number 3.3.1-5**	Loss of material due to general, pitting, and crevice corrosion, and MIC	Plant specific	One-Time Inspection Program (Appendix B.5.5); External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.5)
Components in reactor coolant pump oil collection system of fire protection **Item Number 3.3.1-6**	Loss of material due to galvanic, general, pitting, and crevice corrosion	One-time inspection	One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.6)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Diesel fuel oil tanks in diesel fuel oil system and emergency diesel generator system **Item Number 3.3.1-7**	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Fuel oil chemistry and one-time inspection	Fuel Oil Chemistry Control Program (Appendix B.4.2); One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.7)
Heat exchangers in chemical and volume control system **Item Number 3.3.1-9**	Crack initiation and growth due to SCC and cyclic loading	Water chemistry and a plant-specific verification program	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.9)
Neutron-absorbing sheets in spent fuel storage racks **Item Number 3.3.1-10**	Reduction of neutron-absorbing capacity and loss of material due to general corrosion (boral, boron steel)	Plant specific	None	Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.10)
New fuel rack assembly **Item Number 3.3.1-11**	Loss of material due to general, pitting, and crevice corrosion	Structures monitoring	Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Neutron-absorbing sheets in spent fuel storage racks **Item Number 3.3.1-12**	Reduction of neutron-absorbing capability due to Boraflex degradation	Boraflex monitoring	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Spent fuel storage racks and valves in spent fuel pool cooling and cleanup **Item Number 3.3.1-13**	Crack initiation and growth due to stress corrosion cracking	Water chemistry	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Closure bolting and external surfaces of carbon steel and low-alloy steel components **Item Number 3.3.1-14**	Loss of material due to boric acid corrosion	Boric acid corrosion	Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Components in or serviced by closed cycle cooling waster system **Item Number 3.3.1-15**	Loss of material due to general, pitting, and crevice corrosion, and MIC	Closed cycle cooling waster system	Water Chemistry Control Program (Appendix B.3.2); One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Cranes including bridge and trolleys and rail system in load-handling system **Item Number 3.3.1-16**	Loss of material due to general corrosion and wear	Overhead heavy load and light load handling systems	Structural Monitoring Program (Appendix B.4.3); Overhead and Refueling Crane Inspection Program (Appendix B.3.6)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Components in or serviced by open cycle cooling waster systems **Item Number 3.3.1-17**	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling; buildup of deposits due to biofouling	Open cycle cooling waster system	Service Water Program (Appendix B.4.4)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Buried piping and fittings **Item Number 3.3.1-18**	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	Buried Piping and Tank Inspection Program (Appendix B.5.4)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1) Consistent with GALL, which recommends further evaluation. (See Section 3.3.2.2.11)
Components in compressed air system **Item Number 3.3.1-19**	Loss of material due to general and pitting corrosion	Compressed air monitoring	One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Components (doors and barrier penetration seals) and concrete structures in fire protection **Item Number 3.3.1-20**	Loss of material due to wear; hardening and shrinkage due to weathering	Fire protection	Fire Protection Program (Appendix B.4.5); Structural Monitoring Program (Appendix B.5.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Components in water-based fire protection **Item Number 3.3.1-21**	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling	Fire water system	Fire Protection Program (Appendix B.4.5); One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in diesel fire system **Item Number 3.3.1-22**	Loss of material due to galvanic, general, pitting, and crevice corrosion	Fire protection and fuel oil chemistry	Fire Protection Program (Appendix B.4.5); Fuel Oil Chemistry Control Program (Appendix B.4.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Tanks in diesel fuel oil system **Item Number 3.3.1-23**	Loss of material due to general, pitting, and crevice corrosion	Aboveground carbon steel tanks	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Closure bolting **Item Number 3.3.1-24**	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and SCC	Bolting integrity	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Components (aluminum bronze, brass, cast iron, cast steel) in open cycle cooling waster and closed cycle cooling waster systems, and ultimate heat sink **Item Number 3.3.1-29**	Loss of material due to selective leaching	Selective leaching of materials	Water Chemistry Control Program (Appendix B.3.2); One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)
Fire barriers, walls, ceilings, and floors in fire protection **Item Number 3.3.1-30**	Concrete cracking and spalling due to freeze-thaw, aggressive chemical attack, and reaction with aggregates; loss of material due to corrosion of embedded steel	Fire protection and structures monitoring	Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.3.2.1)

The staff's review of the applicant's auxiliary system and associated components follows several approaches. One approach, documented in Section 3.3.2.1, involves the staff's review of the AMR results for components in the auxiliary system and associated components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in Section 3.3.2.2, involves the staff's review of the AMR results for components in the auxiliary system and associated components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in Section 3.3.2.3, involves the staff's review of the AMR results for components in the auxiliary system and associated components that the applicant indicated are not consistent with the GALL Report or that are not addressed in the GALL Report. Section 3.0.3 of this SER documents the staff's review of AMPs that are credited with managing or monitoring aging effects of the auxiliary system components.

3.3.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Not Recommended

Summary of Technical Information

In Sections 3.3.2.1.1 through 3.3.2.1.24 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the auxiliary system components:

- Water Chemistry Control Program
- Borated Water Leakage Assessment and Evaluation Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Structural Monitoring Program
- Overhead and Refueling Crane Inspection Program
- Service Water Program
- Buried Piping and Tank Inspection Program
- Fire Protection Program
- Fuel Oil Chemistry Control Program

Staff Evaluation

In Tables 3.3.2-1 through 3.3.2-24 of the LRA, the applicant summarized the AMRs for the auxiliary systems and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the staff performed an audit to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation. The staff also identified several areas needing additional information or clarification. The staff’s evaluation of the applicant's responses and clarification appears below.

3.3.2.1.1 Loss of Material Due to Selective Leaching (Table 3.3.1, Line Item 3.3.1-29)

Column 8 of Table 2 (LRA Tables 3.3.2-x) referred to Item 3.3.1-29 of Table 1 for many auxiliary system components with the loss of material aging effects due to selective leaching of carbon steel, copper alloy (brass), and stainless steel materials. The discussion column of Table 1, Item 3.3.1-29, addressed only CCW pumps fabricated from carbon steel. The staff issued RAI 3.3-4 requesting that the applicant provide additional information on how it addressed selective leaching aging mechanisms for copper alloy (brass) and stainless steel materials in the components of the auxiliary systems. The staff also asked the applicant to describe the program credited with detecting the selective leaching of materials and compare it with the GALL AMP X.M33, “Selective Leaching of Materials,” for consistency determination.

By letter dated March 5, 2004, the applicant responded to RAI 3.3-4. In its response, the applicant stated that there are inconsistencies in referencing (LRA Table 3.3.2-x to “Table 1

Item" 3.3.1-29 in Column 8) for carbon steel and stainless steel components. Carbon steel and stainless steel are not susceptible to selective leaching in the auxiliary system environments. The inconsistency was a result of the way the GALL Report is structured and how the information from the GALL Report was transferred to the LRA.

For example, Table 3.3.2-5 of the LRA listed the CCW heat exchanger (shell) line item as having a material of carbon steel, an internal environment of closed-cooling water, and an AERM of loss of material. This matches with the GALL Report, Volume 2, Chapter VII, Item C1.3-a, which includes carbon steel, aluminum-bronze, copper-nickel, and aluminum brass materials. The applicant also provided a table summarizing the components in the Table 3.3.2-x tables which are potentially susceptible to the loss of material due to selective leaching. The staff reviewed the applicant's response and confirmed that these inconsistencies had been corrected.

The applicant credited the One-Time Inspection Program (AMP B.5.5) for detection of selective leaching in potentially susceptible materials.

Section 3.0.3.1 of this SER documents the staff's review of the One-Time Inspection Program In its evaluation, the staff concludes that this program is consistent with GALL AMP XI.M33 for the detection of selective leaching.

The staff concludes that, based on the preceding discussion, the applicant has appropriately identified the components that are susceptible to the loss of material due to selective leaching and adequately described the AMP credited with managing these effects.

3.3.2.1.2 Open-Cycle Cooling Water System (Table 3.3.2-5)

The staff reviewed Table 3.3.2-5 of the LRA which summarizes the results of the AMR evaluations in the SRP-LR for the auxiliary system OCCW system.

Table 3.3.2-5 of the LRA lists loss of material and fouling as aging effects for several components requiring aging management in the OCCW system. The staff noted that fouling is generally an aging effect for heat transfer, not pressure boundary. The staff issued RAI 3.3-3 requesting that the applicant explain how fouling is related to the pressure boundary intended function of these components.

By letter dated March 5, 2004, the applicant responded to RAI 3.3-3. The applicant stated that fouling is not related to the pressure boundary intended function of the channels heads, sheets, and tubesheets of the heat exchangers and coolers listed in Table 3.3.2-5 of the LRA. Therefore, the applicant should not have identified it as an AERM. The applicant stated that no other changes to Table 3.3.2-5 of the LRA result from the removal of fouling as an AERM for these components. This is consistent with the GALL Report, Volume 2, which does not identify fouling as an aging effect applicable to these components. The staff reviewed the applicant's response and confirmed that fouling has been removed as an AERM for these components.

Based on its review and on the preceding discussion, the staff finds the applicant's response acceptable.

3.3.2.1.3 Diesel Fuel Oil System (Table 3.3.2-14)

For the fuel oil storage and EDG day tanks in the fuel oil environment, the applicant, in Table 3.3.2-14 of the LRA, credited the Fuel Oil Chemistry Control Program (AMP B.4.2) for managing the aging effect of loss of material. It also referenced Table 3.3.1, Item 3.3.1-7, of the LRA, which refers to Section 3.3.2.2.7 of the LRA for further discussion. However, Section 3.3.2.2.7 of the LRA states that the Fuel Oil Chemistry Control Program and One-Time Inspection Program (AMP B.5.5) will manage the loss of material in the fuel oil storage and day tanks.

The applicant indicated that this was an editorial error. Table 3.3.2-14 of the LRA should have included the One-Time Inspection Program with the Fuel Oil Chemistry Control Program. By letter dated May 28, 2004, the applicant provided its application errata to address this editorial error. In its application errata, the applicant confirmed that for the fuel oil storage and EDG day tanks in the fuel oil environment, the One-Time Inspection Program (in addition to the Fuel Oil Chemistry Control Program) should be listed in the AMP column. The other table entries for the fuel oil environment remain unchanged. The staff review of the One-Time Inspection Program indicated that this component group is included in the scope of the One-Time Inspection Program in Appendix B.5.5 to the LRA. Therefore, the staff concludes that Item 3.3.1-7 is consistent with the GALL Report.

3.3.2.1.4 Emergency Diesel Generator System (Table 3.3.2-15)

Table 3.3.2-15 of the LRA defines the equipment frames and housings (crankcase ventilation) in the EDG system as consistent with the GALL Report, Item VII.H2.4-a, for material, environment, aging effects, and AMPs.

The staff noted that the GALL Report item is for a different component. The material of the EDG equipment frames and housings in Table 3.3.2-15 of the LRA is cast iron in a wetted air environment. The material for Item VII.H2.4-a is carbon steel in an environment with hot diesel engine gases containing moisture and particulates. Therefore, the material and environment for the equipment frames and housings are different from the material and environment listed in the GALL Report, Item VII.H2.4-a.

The staff issued RAI 3.3-5 requesting the applicant to justify its conclusion that the EDG equipment frames and housing are consistent with the GALL Report, determine whether the One-Time Inspection Program applies to the equipment frames and housings, and make any necessary changes to the table.

By letter dated March 5, 2004, the applicant responded to RAI 3.3-5. The applicant stated that Section 3.0.2 of the LRA provided the aging management strategy comparison with the GALL Report. In Section 3.0.2 of the LRA, the applicant stated that the GALL Report line item comparison is based fundamentally on the intent to manage aging. Section 3.0.3.4.2 of the LRA states the following:

> The aging management line item comparison is performed with the goal of illustrating the best possible match between a Table 2 of the LRA line item and a GALL Report Volume 2 aging management line item. The primary emphasis is placed on finding a similar aging management strategy for the same material and environment combination. The aging management strategy comparison is provided as a review aid only.

In addition, the applicant stated that the cast iron component type in question, “equipment frames and housings (crankcase ventilation),” is part of the crankcase exhaust system on the

EDGs. Table 3.3.2-15 of the LRA compares the cast iron crankcase component type to the GALL Report, Item VII.H.2.4-a, with a note C. Note C indicates that the component is different but is consistent with the GALL Report for material, environment, and aging effects, and the AMP is consistent with the GALL AMP. The applicant agreed that the cast iron material is technically different from the GALL Report item of carbon steel material and that the use of note C causes confusion. However, the applicant provided the GALL Report comparison information only as a review aid. The applicant stated that no change to the AMR results (e.g., aging effects and AMPs) in Table 3.3.2-15 of the LRA was required.

Based on its review of the applicant's clarification, the staff concurs that this line item is consistent with the GALL Report component line item selected for comparison.

On the basis of its review, the staff determined that for AMRs not requiring further evaluation, as identified in Table 3.3.1 of the LRA (Table 1), the applicant's references to the GALL Report are acceptable and no further staff review is required.

<u>Conclusion</u>

The staff has evaluated the applicant's claim of consistency with the GALL Report. The staff also has reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Recommended

<u>Summary of Technical Information in the Application</u>

In Section 3.3.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for auxiliary systems. The applicant provided information concerning how it will manage the following aging effects:

- loss of material due to general, pitting, and crevice corrosion
- hardening and cracking or loss of strength due to elastomer degradation or loss of material due to wear
- cumulative fatigue damage
- crack initiation and growth due to cracking or stress-corrosion cracking
- loss of material due to general, microbiologically influenced, pitting, and crevice corrosion
- loss of material due to general, galvanic, pitting, and crevice corrosion

- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and biofouling

- quality assurance for aging management of nonsafety-related components

- crack initiation and growth due to stress-corrosion cracking and cyclic loading

- reduction of neutron-absorbing capacity and loss of material due to general corrosion

- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion

Staff Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed these issues. In addition, the staff audited the applicant's additional evaluations against the criteria contained in Section 3.3.2.2 of the SRP-LR. The FNP Audit and Review Report contains details of these staff activities.

The GALL Report indicates that further evaluation should be performed for the aging effects described in the following sections.

3.3.2.2.1 Loss of Material Due to General, Pitting, and Crevice Corrosion

In Section 3.3.2.2.1 of the LRA, the applicant addressed the loss of material in components of the spent fuel pool system.

Section 3.3.2.2.1 of the SRP-LR states that the loss of material due to general, pitting, and crevice corrosion could occur in the channel head and access cover, tubes, and tubesheets of the heat exchanger in the spent fuel pool cooling and cleanup system. The SRP-LR also states that the loss of material due to pitting and crevice corrosion could occur in the filter housing, valve bodies, and nozzles of the ion exchanger in the spent fuel pool cooling and cleanup system. The Water Chemistry Control Program relies on monitoring and control of reactor water chemistry based on EPRI TR-105714 guidelines for primary water chemistry in PWRs and EPRI TR-102134 for secondary water chemistry in PWRs to manage the effects of loss of material from general, pitting, or crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause general, pitting, or crevice corrosion. Therefore, applicants should verify the effectiveness of the chemistry control program to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the Water Chemistry Control Program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation. No loss of material aging effects are observed for stainless steel components exposed to air. The GALL Report lists the material for this system as carbon steel with elastomer lining.

The applicant stated that it uses stainless steel material for this system; therefore, this aging effect is not applicable to FNP. The staff concurs with this conclusion.

3.3.2.2.2 Hardening and Cracking or Loss of Strength Due to Elastomer Degradation or Loss of Material Due to Wear

In Section 3.3.2.2.2 of the LRA, the applicant addressed the potential for degradation of elastomers in collars and seals in spent fuel pool cooling and ventilation systems.

Section 3.3.2.2.2 of the SRP-LR states that hardening and cracking due to elastomer degradation could occur in elastomer linings of the filter, valve, and ion exchangers in spent fuel pool cooling and cleanup systems. Hardening and loss of strength due to elastomer degradation could occur in the collars and seals of the duct and in the elastomer seals of the filters in the control room area, auxiliary and radwaste area, and primary containment heating and ventilation systems, and in the collars and seals of the duct in the diesel generator building ventilation system. Loss of material due to wear could occur in the collars and seals of the duct in the ventilation systems. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

In Table 3.3.2-9 of the LRA, for component type "compressible joints and seals," the applicant credited the One-Time Inspection Program (AMP B.5.5) with managing the aging effects of change in material properties and loss of material. It also referenced Summary Table 1 of the LRA, Item 3.3.1-2, which referred to Section 3.3.2.2.2 of the LRA for further discussion. However, in Section 3.3.2.2.2 of the LRA, the applicant stated that the External Surfaces Monitoring Program will manage the applicable aging effects for this component type. The staff noted that it is not clear which AMP is credited. During a telephone conference on April 26, 2004, the staff requested that the applicant revise its response to RAI 3.3-6 to clarify which AMP is credited.

In its letter dated May 28, 2004, the applicant provided its revised response to RAI 3.3-6 and stated that it had revised the aging management strategy to credit the AMP B.5.3, "External Surfaces Monitoring Program," to periodically inspect these elastomer seals and collars in ventilation systems in lieu of the One-Time Inspection Program. The applicant concluded that while significant aging of elastomer components is not expected to result from this potential aging mechanism, the applicant will include the flexible connectors and floor drain plug elastomer components in the scope of the External Surfaces Monitoring Program (in lieu of the One-Time Inspection Program). The applicant stated that the External Surfaces Monitoring Program will provide for periodic inspection of the elastomer components and will ensure their continued ability to perform their intended functions.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving management of hardening and cracking or loss of strength due to elastomer degradation or loss of material due to wear, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.3 Cumulative Fatigue Damage

As stated in the SRP-LR, fatigue is a TLAA as defined in 10 CFR 54.3. The TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). Section 4.3 of this SER documents the staff's review of the applicant's evaluation of this TLAA. In performing this review, the staff followed the guidance in Section 4.3 of the SRP-LR.

3.3.2.2.4 Crack Initiation and Growth due to Cracking or Stress-Corrosion Cracking

In Section 3.3.2.2.4 of the LRA, the applicant addressed the potential for cracking in the high-head pumps of the chemical and volume control system.

Section 3.3.2.2.4 of the SRP-LR addresses crack initiation and growth due to cracking in the high-pressure pumps of the chemical and volume control system. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

The applicant stated in a supplemental letter dated August 31, 2004, that its high head pumps are centrifugal pumps normally used for chemical and volume control, and are shared with the emergency core cooling system. The aging management review results are included with the emergency cooling system results in LRA Table 3.2.2-3. These high-head pump casings are carbon steel with internal surfaces clad with austenitic stainless steel. The applicant indicated that the aging effect requiring management for the borated water environment is loss of material due to localized corrosion. In addition, the normal operating temperature of these pumps is below the 140 °F threshold for SCC. The applicant credited the Water Chemistry Control Program (AMP B.3.2) for managing loss of material in the stainless steel cladding in these pump casings and the Periodic Surveillance and Preventive Maintenance Activities (AMP B.5.9) for managing loss of material in the carbon steel base metal due to boric acid corrosion resulting from clad cracking (re., IN 94-63 and IN 80-38.)

The staff reviewed the Water Chemistry Control Program (AMP B.3.2) and concluded that this program is adequate to manage the loss of material in the stainless steel cladding due to localized corrosion for the borated water environment. Also, the staff reviewed the Periodic Surveillance and Preventive Maintenance Activities (AMP B.5.9) and concluded that this program adequately manages loss of material in the carbon steel base metal due to boric acid corrosion. Sections 3.0.3.2.1 and 3.0.3.3.4 of this SER document the staff's evaluation of these programs. Based on the preceding discussion, the staff finds that the Water Chemistry Control Program and the Periodic Surveillance and Preventive Maintenance Activities are acceptable for managing these aging effects.

3.3.2.2.5 Loss of Material Due to General, Microbiologically Influenced, Pitting, and Crevice Corrosion

In Section 3.3.2.2.5 of the LRA, the applicant addressed the loss of material from corrosion that could occur on the internal and external surfaces of components exposed to air and the associated range of atmospheric conditions.

Section 3.3.2.2.5 of the SRP-LR states that the loss of material due to general, pitting, and crevice corrosion could occur in the piping and filter housing and supports in the control room area; the auxiliary and radwaste area; the primary containment heating and ventilation systems; the piping of the diesel generator building ventilation system; the aboveground piping and fittings, valves, and pumps in the diesel fuel oil system; and the diesel engine starting air, combustion air intake, and combustion air exhaust subsystems in the EDG system. Loss of material due to general, pitting, and crevice corrosion and MIC could occur in the duct fittings, access doors, and closure bolts, equipment frames, and housing of the duct. Loss of material due to pitting and crevice corrosion could occur in the heating/cooling coils of the air handler heating/cooling, and loss of material due to general corrosion could occur on the external surfaces of all carbon steel structures and components, including bolting exposed to operating temperatures less than 212 °F in the ventilation systems. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

In RAI 2.3.3.15-1, the staff questioned why the applicant did not include nonsafety-related air dryers/aftercoolers in the air start systems for the EDGs within the scope of license renewal. In its response dated April 22, 2004, the applicant stated that the air dryer/aftercoolers assemblies are in the scope of license renewal and added the air dryers/aftercoolers to the EDG system AMR summary in Table 3.3.2-15. The staff reviewed the addition of these components subject to an AMR and concluded that the addition of these components does not result in the addition of material-environment combinations or AMPs for the EDG system.

The applicant credited the One-Time Inspection Program (AMP B.5.5) with addressing the loss of material due to corrosion of carbon and low-alloy steel, including galvanized steel, in ventilation system components (air handling/cooling units), in EDG intake components, and in EDG starting air components where the potential exists for significant condensation or pooling of water within the system. In addition, the applicant will inspect a sample set of carbon steel components exposed to an air/gas environment as part of the One-Time Inspection Program to confirm that no significant corrosion is occurring within these components.

The applicant stated that the External Surfaces Monitoring Program (AMP B.5.3) manages EDG exhaust components and loss of material due to corrosion of the external surfaces of carbon steel components.

The staff's review of the One-Time Inspection Program and the External Surfaces Monitoring Program appears in Sections 3.0.3.1 and 3.0.3.3.2 of this SER, respectively. The staff finds these programs acceptable to manage the aging effect of loss of material in components in the ventilation systems, emergency generating systems, and external surfaces of carbon steel components.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving management of the loss of material due to general, pitting, and crevice corrosion, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Loss of Material Due to General, Galvanic, Pitting, and Crevice Corrosion

In Section 3.3.2.2.6 of the LRA, the applicant addressed further evaluation of programs to manage the loss of material in the RCP oil collection system to verify the effectiveness of the Fire Protection Program.

Section 3.3.2.2.6 of the SRP-LR states that the loss of material due to general, galvanic, pitting, and crevice corrosion could occur in tanks, piping, valve bodies, and tubing in the RCP oil collection system. The Fire Protection Program relies on a combination of visual and volumetric examinations in accordance with the guidelines of Appendix R to 10 CFR Part 50 and BTP 9.5-1 to manage loss of material from corrosion. However, corrosion may occur at locations where water from washdowns accumulates. Therefore, the effectiveness of the program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage the loss of material due to general, galvanic, pitting, and crevice corrosion to verify the effectiveness of the program. A one-time inspection of the bottom half of the interior surface of the tank of the RCP oil collection system 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 applicant credited the One-Time Inspection Program (AMP B.5.5) with managing the loss of material due to corrosion on the internal surfaces of components in the RCP oil collection system and with verifying the effectiveness of the fire protection system.

The staff's evaluation of the One-Time Inspection Program appears in Section 3.0.3.1 of this SER. Since the one-time inspection will focus on low points where water could accumulate, the staff concludes that this program is acceptable to manage the loss of material due to corrosion on the internal surfaces of components in the RCP oil collection system. In addition, the staff concludes that the use of the One-Time Inspection Program to verify the effectiveness of the fire protection system is consistent with the GALL Report and, therefore, is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving management of the loss of material due to general, galvanic, pitting, and crevice corrosion, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.7 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion and Biofouling

In Section 3.3.2.2.7 of the LRA, the applicant addressed further evaluation of programs to manage loss of material in the diesel fuel oil system to verify the effectiveness of the Fuel Oil Chemistry Control Program.

Section 3.3.2.2.7 of the SRP-LR states that loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling could occur on the internal surfaces of tanks in the diesel fuel oil system, and loss of material due to general, pitting, and crevice corrosion and MIC could occur in the tanks of the diesel fuel oil system in the EDG system. The existing AMP relies on the Fuel Oil Chemistry Control Program for monitoring and control of fuel oil contamination, in accordance with the guidelines of ASTM Standards D4057, D1796, D2709, and D2276, to manage the loss of material due to corrosion or biofouling. Corrosion or biofouling may occur at locations where contaminants accumulate. The effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion/biofouling to verify program effectiveness.

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 applicant credited the Fuel Oil Chemistry Control Program (AMP B.4.2) and the One-Time Inspection Program (AMP B.5.5) with managing the aging effect of loss of material for diesel fuel oil tanks in the diesel fuel oil system, which is consistent with the GALL Report, with one exception. The applicant used a different ASTM standard for the Fuel Oil Chemistry Control Program.

The staff finds the use of a different ASTM standard for the Fuel Oil Chemistry Control Program acceptable. The staff reviewed the exception to the ASTM standard, which the applicant used in accordance with TS Section 5.5.13. The applicant tests for water and sediments, kinematic viscosity, insolubles, bacteria, and fungi. The applicant does not test for particulates as required by the GALL Report. The staff determined that this exception is acceptable, because sediments are a good indicator of particulates and the standards and criteria used by the applicant are consistent with the TS requirements that are part of the CLB. The staff's evaluations of the Fuel Oil Chemistry Control Program and One-Time Inspection Program are contained in Sections 3.0.3.2.3 and 3.0.3.1 of this SER, respectively. The staff finds these programs acceptable to manage the aging effects of loss of materials for diesel fuel oil tanks in the diesel fuel oil system.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving the management of the loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Quality Assurance for Aging Management of Nonsafety-Related Components

See "Quality Assurance Program Attributes Integral to Aging Management Programs" in Section 3.0.4 of this SER.

3.3.2.2.9 Crack Initiation and Growth Due to Stress-Corrosion Cracking and Cyclic Loading

In Section 3.3.2.2.9 of the LRA, the applicant addressed the further evaluation of programs to manage cracking in the chemical and volume control system to verify the effectiveness of the Water Chemistry Control Program.

Section 3.3.2.2.9 of the SRP-LR states that crack initiation and growth due to SCC and cyclic loading could occur in the channel head and access cover, tubesheet, tubes, shell and access cover, and closure bolting of the regenerative heat exchanger and in the channel head and access cover, tubesheet, and tubes of the letdown heat exchanger in the chemical and volume control system. The Water Chemistry Control Program relies on monitoring and control of water chemistry based on the guidelines of EPRI TR-105714 for primary water chemistry in PWRs to manage the effects of crack initiation and growth due to SCC and cyclic loading. The effectiveness of the chemistry control program should be verified to ensure that crack initiation and growth are not occurring. The GALL Report recommends further evaluation to manage crack initiation and growth from SCC and cyclic loading for these systems to verify the effectiveness of the Water Chemistry Control Program. A one-time inspection of selected components and susceptible locations is an acceptable method to ensure that crack initiation and growth are not occurring and that the component's intended function will be maintained during the period of extended operation.

The applicant credited the Water Chemistry Control Program (AMP B.3.2) with managing the aging effect of cracking. Furthermore, a One-Time Inspection performed on ASME Class 1 small-bore piping would serve as an equivalency indicator for any SCC of stainless steel components in the reactor coolant environment.

The staff finds this is consistent with the GALL Report, Volume 2, Section VII.E1, which requires a verification program to confirm the adequacy of the Water Chemistry Control Program to manage cracking. However, this equivalency indicator is not reflected in the commitment list nor in Appendix A to the LRA for the FSAR Supplement.

In its letter dated July 27, 2004 (SNL Letter No. NL-04-1267), the applicant provided the FNP License Renewal Future Action Commitment List and included the following statement in Item 10, under specific components included in the One-Time Inspection sample population:

> Examination of Reactor coolant system small bore (<4-inch NPS) ASME Class 1 piping components, consistent with NUREG-1801 Section XI.M32 requirements, to address NRC concerns regarding cracking due to SCC or thermal cycling. This examination will also serve as an indicator of the potential for SCC in other stainless steel components exposed to a borated water environment.

Section 3.0.3.2.1 of this SER documents the staff's evaluation of the Water Chemistry Control Program. The staff finds this program, in conjunction with the commitment, acceptable to manage the aging effects.

On the basis of its review, the staff finds that the applicant has appropriately evaluated AMR results involving management of crack initiation and growth due to SCC and cyclic loading, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

In Section 3.3.2.2.10 of the LRA, the applicant addressed the reduction of neutron-absorbing capacity and loss of material due to general corrosion, which could occur in the neutron-absorbing sheets of the spent fuel storage rack in the spent fuel storage system.

Section 3.3.2.2.10 of the SRP-LR states that the reduction of neutron-absorbing capacity and loss of material due to general corrosion could occur in the neutron-absorbing sheets of the spent fuel storage rack in the spent fuel storage system. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

The applicant stated that this line item applies to boral or boron steel panels in the spent fuel pool. The applicant uses Boraflex panels, so this line item does not apply to FNP. The staff concurs with this assessment.

3.3.2.2.11 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

In Section 3.3.2.2.11 of the LRA, the applicant addressed the potential for the loss of material in buried piping of the service water and diesel fuel oil systems.

Section 3.3.2.2.11 of the SRP-LR states that loss of material due to general, pitting, and crevice corrosion and MIC could occur in the underground piping and fittings in the open-cycle cooling water system (OCCW) (service water system) and in the diesel fuel oil system. The Buried Piping and Tanks Inspection Program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion and MIC. To ensure that loss of material is not occurring, the effectiveness of the Buried Piping and Tanks Inspection Program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components.

The applicant stated that the AMR results are consistent with this summary item. The applicant credited the Buried Piping and Tank Inspection Program (AMP B.5.4) with managing the loss of material on the external surfaces of buried carbon steel piping. The buried piping susceptible to this aging effect is made of carbon steel coated with a fiber-reinforced coal tar enamel.

The staff evaluated the Buried Piping and Tank Inspection Program and concluded that it is adequate to manage the aging effects. Section 3.0.3.2.10 of this SER documents the staff's evaluation. The staff also reviewed the effectiveness of the Buried Piping and Tank Inspection Program, including its inspection frequency and operating experience, to ensure that loss of material is not occurring and that the component intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's operating history, which indicates that failures of in-scope buried carbon steel piping resulting from external corrosion have been small and limited to service water (OCCW system) piping. The applicant attributed these failures to coating holidays or damage to the coating. However, FNP detected the leaks before any loss of system function occurred.

Based on its review of the inspection frequency and operating experience, the staff finds that the Buried Piping and Tank Inspection Program adequately manages the potential for the loss of material in buried piping of the service water and diesel fuel oil systems. By letter dated August 31, 2004, the applicant added portions of the compressed air system to the Buried Piping and Tank Inspection Program.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving the management of the loss of material due to general, pitting, and crevice corrosion and MIC, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Conclusion

On the basis of its audit and review, the staff finds that the applicant's further evaluations conducted in accordance with the GALL Report are consistent with the acceptance criteria in Section 3.3.2.2 of the SRP-LR. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3 AMR Results That Are Not Consistent with or Not Addressed in the GALL Report

3.3.2.3.0 General RAIs on AMR Issues

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in the following general RAIs. By letter dated April 7, 2004, the applicant responded to these RAIs. The following describes these RAIs, the applicant's responses, and the staff's evaluation of the responses.

Aging Effects of Elastomers (RAI 3.3-6)

In several systems (including the control room area ventilation system, the auxiliary and radwaste area ventilation system, and the liquid waste and drains system), the applicant credited the One-Time Inspection Program with managing the aging effects of loss of materials, change in material property, and cracking for elastomer components. However, the One-Time Inspection Program is intended for use as a verification AMP to check the degree of aging of components when significant aging is not expected, while periodic inspections are more appropriate if aging effects can reasonably be expected to occur. The degradation of elastomers depends upon the service loads and environmental conditions, including temperature, radiation level, and presence of aggressive chemicals. By letter dated March 8, 2004, in RAI 3.3-6, the staff asked the applicant to provide additional information on the service loads and environment of the components to justify the use of the One-Time Inspection Program for managing the aging effects of elastomers.

By letter dated April 7, 2004, the applicant responded by providing the following information.

Environmental Considerations for Elastomers

The applicant stated that EPRI TR-1002950, "Aging Effects for Structures and Structural Components (Structural Tools), Revision 1," indicates that elastomers are potentially subject to thermal degradation. Thermal degradation results in changes in the elastomer properties and potential cracking. The EPRI technical report provides temperature ratings for the evaluated elastomers ranging from 130 °F for natural rubber to 275 °F for silicone rubber. The EPRI technical report states that, in general, if the ambient temperature is less than 95 °F, then thermal aging is not significant for the period of extended operation. This is a conservative threshold temperature intended to encompass all elastomer materials. When the specific elastomer material type is considered, installation in thermal environments marginally above 95 °F may also not be susceptible to significant thermal degradation.

The applicant also stated that the EPRI technical report indicates that degradation of natural rubbers can occur through simultaneous exposure to ultraviolet radiation and oxygen, which supports an ozone-rubber reaction that embrittles the rubber and can result in cracking or checking. Sources of ultraviolet radiation include both sunlight and ultraviolet or fluorescent lamps. Areas exposed to direct sunlight are expected to have the highest potential for degradation resulting from ultraviolet radiation/ozone exposure since this environment best supports both the formation of ozone and the reaction between ozone and natural rubbers. The EPRI technical report indicates that nitrile rubber, butyl rubber, silicone rubber, and neoprene either have good resistance to or are essentially unaffected by ultraviolet radiation/ozone degradation.

The applicant noted that the EPRI technical report indicates that ionizing radiation can significantly alter the molecular structure and material properties of elastomers. Radiation levels exceeding 10^6 rads are the lowest reported threshold for irradiation effects in an elastomer of the types in scope for license renewal. Conservatively, radiation embrittlement is postulated for elastomers in locations above this threshold.

The applicant stated that attack by chemical species is also a potential degradation mechanism. Experience has shown that exposure to certain chemicals present in nuclear power plants can embrittle rubbers. According to Table 28-27 of Perry's *Chemical Engineer's Handbook,* most of the all-natural and synthetic rubbers offer poor resistance to oils and fuel products. Resistance to water and acids is fair to good for some rubbers and excellent for others, with resistance to acid attack generally the limiting factor.

FNP Environments for Elastomers in the Scope of the One-Time Inspection Program

Control Room Area Ventilation System. The applicant stated that elastomer components in the control room area ventilation system are located inside the non-rad portion of the auxiliary building. These components are protected from environmental effects, have no radiation loading, are not subject to attack by aggressive chemicals, and operate at temperatures below the threshold temperature at or above which thermal degradation is a significant concern.

Auxiliary and Radwaste Area Ventilation System. The applicant stated that the in-scope elastomer components in the auxiliary and radwaste area ventilation system are divided between two locations (the rad portion and the non-rad portion of the auxiliary building). Flexible connectors for the battery room exhaust fans are located inside the non-rad portion of the auxiliary building. These components are protected from environmental effects, have no radiation loading, are not subject to attack by aggressive chemicals, and operate at temperatures below the threshold temperature at or above which thermal degradation is a significant concern. Flexible connectors for the penetration room filtration fans are located inside the rad portion of the auxiliary building. These components are protected from environmental effects, are not subject to attack by aggressive chemicals, and operate at temperatures below the threshold temperature at or above which thermal degradation is a significant concern. While these components are located in the rad portion of the auxiliary building, normal operating conditions provide for no significant radiation loading.

Primary Containment Ventilation System. The applicant stated that the in-scope elastomer components in the primary containment ventilation system are divided between two locations. Flexible connectors for the containment purge fans are located inside the rad portion of the auxiliary building. These components are protected from environmental effects, are not subject to attack by aggressive chemicals, and operate at temperatures below the threshold temperature at or above which thermal degradation is a significant concern. While these components are located in the rad portion of the auxiliary building, normal operating conditions provide for no significant radiation loading. Flexible connectors for the containment coolers are located inside the containment building. These components are replaced periodically as a preventive maintenance task. These components are therefore short-lived and not subject to an AMR.

Liquid Waste and Drains System. The applicant stated that the elastomer components in the liquid waste and drains system are expandable plugs used to plug the penetration room floor drains. Plugging of the floor drains provides a pressure boundary for the penetration room filtration system. These floor drain plugs are located inside the rad portion of the auxiliary building. These components are protected from environmental effects and the threshold temperature at or above which thermal degradation is a significant concern. While these components are located in the rad portion of the auxiliary building, normal operating conditions provide for no significant radiation loading. The floor drain plugs are installed in drains which would collect leakage and spills. Although unlikely, exposure to aggressive chemicals is considered. The One-Time Inspection Program will confirm that the plugs have not been exposed to conditions detrimental to the seals.

The applicant concluded that the One-Time Inspection Program is an appropriate AMP for these elastomer components. These elastomer components are installed in locations with minimal exposure to potential aging mechanisms, and therefore significant aging is not expected.

Staff Evaluation of the Applicant’s Response

The staff reviewed the applicant’s response to RAI 3.3-6. The staff found the applicant’s response to issues concerning elastomer components in the control room area ventilation system to be reasonable and acceptable because the applicant has indicated that these components are protected from environmental effects, have no radiation loading, are not subject to attack by aggressive chemicals, and operate at temperatures below the threshold temperature at or above which thermal degradation is a significant concern.

The staff also found the applicant’s response to issues concerning flexible connectors for the containment coolers located inside the containment building to be reasonable and acceptable because the applicant has indicated that it replaces these components periodically as a preventive maintenance task and, therefore, these components are short-lived and not subject to an AMR.

However, the staff has reviewed the other parts of the applicant’s response to RAI 3.3-6 and found that it needed further clarification.

The applicant stated that for the rad portion of the auxiliary building, normal operating conditions provide for no significant radiation loading. In a telephone conference on April 26, 2004, the staff asked the applicant to clarify whether under normal operating conditions, the rad portion of the auxiliary building is under a radiation loading below that of 10^6 rads, the lowest reported threshold for irradiation effects in an elastomer of the types within the scope of license renewal, according to EPRI TR-1002950. The staff also asked the applicant to provide industry and/or plant-specific operating experience with radiation-related aging degradation of these elastomer components.

The applicant stated that in the liquid waste and drains system, the floor drain plugs are installed in drains which would collect leakage and spills, etc, and that although unlikely, exposure to aggressive chemicals is considered. In the same telephone conference, the staff asked the applicant to clarify the extent of aggressive chemicals in leakage or spills to justify its conclusion that exposure to aggressive chemicals is unlikely. The staff also asked the applicant to provide industry and/or plant-specific operating experience with the aggressive chemicals related to aging degradation of these elastomer components.

On April 26, 2004, in a telephone conference and later confirmed by letter dated May 28, 2004, the applicant responded to the staff's comments described above on the initial response to RAI 3.3-6. The applicant stated that the revised response to RAI 3.3-6 dated May 28, 2004, supersedes SNC's response in SNC Letter No. NL-04-0473, dated April 7, 2004.

The applicant stated that a cumulative dose of $1x10^6$ rads over 60 years would require a continuous hourly dose rate of 1.9 rads/hr, or 1900 mrad/hr. The in-scope elastomer components in the auxiliary and radwaste area ventilation system that are located in the rad portion of the auxiliary building are in rooms designated as Radiation Zone III. The applicant stated that the projected dose rate in a Radiation Zone III area is less than or equal to 15 mrem/hr.

For in-scope elastomer components in the primary containment ventilation system that are located in rooms designated as Radiation Zones III and V, the applicant clarified that the projected dose rate in a Radiation Zone V area exceeds 100 mrem/hr. However, the applicant also stated that recent survey data in the Radiation Zone V rooms showed maximum general area dose rates in the area of the in-scope components of 15 mrem/hr (Unit 1) and 14 mrem/hr (Unit 2), with both units operating at 100 percent power. In addition, the applicant stated that flexible connectors for the containment coolers are located inside the containment building and that these components are replaced periodically as a preventive maintenance task. The applicant concluded that these components are therefore short-lived and not subject to an AMR.

The applicant further stated that the elastomer components in the liquid waste and drains system are located in rooms designated as Radiation Zone V or less. The applicant stated that actual dose rates are typically significantly less than 100 mrem/hr, as shown in the previous example for the primary containment ventilation system. In addition, the applicant stated that the concrete of the floor shields the drain plugs from many sources. The floor drain plugs are installed in drains which would collect leakage and spills. The applicant considers exposure to aggressive chemicals unlikely because the systems in these areas do not contain such chemicals. Piping containing a mild boric acid solution is the only significant source of chemical contamination, and leakage from these systems is aggressively controlled. The applicant stated that although it is unlikely, it considered exposure to aggressive chemicals as having the potential to accelerate aging of these plugs.

Finally, the applicant concluded that, while significant aging of elastomer components is not expected because of their installation in locations that have minimal exposure to potential aging mechanisms, SNC will include the flexible connectors and floor drain plug elastomer components in the scope of the External Surfaces Monitoring Program (in lieu of the One-Time Inspection Program). The applicant clarified that the External Surfaces Monitoring Program will provide for periodic inspection of the elastomer components and will ensure their continued ability to perform their intended functions.

The staff reviewed the applicant's responses and found them to be reasonable and acceptable because the applicant indicated that the applicable in-scope elastomer components in the auxiliary and radwaste area ventilation system, the primary containment ventilation system, and the liquid waste and drains system are either in Radiation Zone III or Zone V. These components in these radiation zones will be exposed, over 60 years, to a projected radiation loading below that of the lowest reported threshold (10^6 rads) for irradiation effects in an elastomer of the types in scope for license renewal. In addition, the applicant will include the flexible connectors and floor drain plug elastomer components in the scope of the External Surfaces Monitoring Program (in lieu of the One-Time Inspection Program) which includes periodic inspections of the elastomer components.

<u>Aging Effects of Galvanized Steel Components Exposed to an Inside Environment (RAI 3.3-7)</u>

Galvanized steel components exposed to a moist air environment may experience corrosion. However, for numerous systems, the LRA states that there is no aging effect on galvanized steel ducts and fittings exposed to an inside environment, which is moist and humid air. Industry experience may not support this conclusion. By letter dated March 8, 2004, in RAI 3.3-7, the staff asked the applicant to provide the technical basis for this conclusion in light of industry experience.

By letter dated April 7, 2004, the applicant responded that operating experience indicates that significant condensation is necessary to have an AERM on galvanized steel. For corrosion of galvanized steel components to occur, both oxygen and moisture must collect on the component surface. Galvanized carbon steel ducts and fittings in the inside environment listed in the LRA with no AERM do not experience significant condensation/moisture collection, because they operate at temperatures similar to the surrounding ambient air conditions and significant condensation is not expected.

The applicant further stated that significant moisture collection/condensation can occur on galvanized steel ducts and fittings where humid air is exposed to a much colder surface, such as at cooling coils. Therefore, SNC listed cooling coil units (including their housings) in the LRA with aging effects associated with moisture collection/condensation. In locations where significant moisture collection/condensation can occur, the AERMs for galvanized carbon steel were the same as those for plain carbon steel, and therefore SNC elected to include them in the LRA under a single material type of carbon steel. The applicant provided the following examples in the LRA:

- cooling coil units and associated refrigerant piping (housings, coils, fins, drains, refrigerant lines) in LRA Table 3.3.2-9
- cooling units (housings and fan/coil fins only) in Table 3.3.2-10
- equipment frames and housings (includes cooling coil housings and cooling fins) in Table 3.3.2-11

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3-7 and found the response to be reasonable and acceptable because the applicant indicated that galvanized carbon steel ducts and fittings in the inside environment listed in the LRA with no AERM do not experience significant condensation/moisture collection. They do not experience this condition because they operate at temperatures similar to the surrounding ambient air conditions, and significant condensation is not expected. Furthermore, the applicant clarified that in locations where significant moisture collection/condensation can occur, the AERMs for galvanized carbon steel were the same as for plain carbon steel. Therefore, the applicant elected to include them in the LRA under a single material type of carbon steel.

Aging Effects of Galvanized Steel Components Exposed to Borated Water (RAI 3.3-8)

In several systems (for example, the auxiliary and radwaste area ventilation system and the fire protection system), the applicant identified the loss of materials as a plausible aging effect for galvanized steel components in the inside environment and credited the Borated Water Leakage Assessment and Evaluation Program with managing this aging effect. However, galvanized steel components are not in the scope of the Borated Water Leakage Assessment and Evaluation Program, and it is not clear from the LRA what mitigation or corrective actions the applicant will take if it detects such corrosion. By letter dated March 8, 2004, in RAI 3.3-8, the staff asked the applicant to provide information on the effects of boric acid corrosion on the galvanized steel components and how it will manage this aging effect. The staff also asked the applicant to provide operating experience, if any, relating to boric acid corrosion of the relevant galvanized steel components.

By letter dated April 7, 2004, the applicant responded that the reference to carbon steel components in LRA Section B.3.5 includes all components that are fabricated from a carbon steel base metal. For the FNP LRA, the designation of carbon steel includes galvanized steel components such as the galvanized steel ducts and fire protection components identified in the LRA and alloy steels such as those used in bolting.

The applicant also stated that the Borated Water Leakage Assessment and Evaluation Program inspects borated water systems at FNP for leakage and evidence of leakage. When boric acid leaks are discovered, the program identifies the components within the boric acid leak-path in addition to the leakage source, so that the operators can take appropriate corrective action. The applicant claimed that a review of plant-specific operating experience revealed no evidence of loss of material due to boric acid corrosion of galvanized steel components, including those within the scope of license renewal.

The applicant stated that the galvanized material of these components consists of carbon steel coated with a thin outer layer of zinc. The zinc tends to neutralize any acidic moisture that makes contact with the material surface.

The applicant further stated that because of the protective nature of the zinc coating of the carbon steel surface, loss of material due to boric acid is expected to be less severe than in the case of plain carbon steel but is still assumed to occur. The applicant has conservatively included galvanized carbon steel materials located near borated water system components within the scope of the Borated Water Leakage Assessment and Evaluation Program.

Therefore, the applicant concluded that loss of material in the inside environment for galvanized carbon steel components will be adequately managed during the period of extended operation.

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3-8 and found it to be reasonable and acceptable because the applicant indicated that the applicant inspects the borated water systems at FNP for leakage and evidence of leakage in accordance with the Borated Water Leakage Assessment and Evaluation Program, and that the applicant conservatively included galvanized carbon steel materials located near borated water system components within the program scope.

Clarification of the Definition of "Inside Environment" for All Buildings (RAI 3.3-9)

In Table 3.0.4-1 of the LRA, the applicant provided specifics of the inside environment. In particular, it provided the average temperature of 120 °F and the humidity range of 5–95 percent within the containment. By letter dated March 8, 2004, in RAI 3.3-9, the staff asked the applicant to clarify whether it expects the conditions specified for the containment environment to be bounding for the inside environment for all those buildings listed in the description column, and whether it assumes that those conditions apply to the aging of all components in an inside environment. The staff also asked the applicant to discuss whether conditions exist that render components susceptible to periodic wetting and drying and, if so, to address the issue of applicable aging effects in these types of inside environments.

By letter dated April 7, 2004, the applicant responded that it had used the inside environmental descriptor in the LRA to represent the containment environment and the environments found within environmentally controlled structures. The minimum temperature in these structures is controlled to prevent freezing. Ventilation is also provided. Although environmental conditions inside containment are the bounding conditions for the inside environment, the applicant considered the actual conditions experienced, including operating experience, in the AMRs.

The applicant also stated that in evaluating the potential for condensation and water pooling, it assumed all areas with an inside environment to have high relative humidity. The operating temperature range for the process fluid drives the potential for condensation and periodic wetting and drying, such as that which occurs in relatively cold service water and in the various cooling coil units. Antisweat insulation is installed on the piping which is most prone to condensing atmospheric moisture. Process lines that operate at high temperatures result in localized temperatures above the ambient conditions and therefore do not have a potential for periodic wetting and drying. In the AMRs, the applicant evaluated the potential for periodic wetting and drying for the individual components and for AMP selection. For susceptible materials in susceptible locations, the applicant identified loss of material as an AERM in the inside environment.

The applicant indicated that in evaluating elastomers (discussed in the response to RAI 3.3-6), it considered the localized temperatures and radiation levels in the AMRs.

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3-9 and found the response to be reasonable and acceptable because the applicant showed that environmental conditions inside containment are the bounding conditions for the inside environment, and because the applicant considered the actual conditions experienced, including the potential for periodic wetting and drying as well as operating experience, in the AMRs.

Use of Water Chemistry Control Program Without an Inspection for Managing the Loss of Material for Stainless Steel Components (RAI 3.3-10)

The Water Chemistry Control Program is normally augmented by an inspection program to verify the effectiveness of the AMP, especially for stagnant or low-flow areas. For example, the applicant credited the Water Chemistry Control Program augmented by the One-Time Inspection Program with managing the aging effects for carbon steel components exposed to the CCCW environment. However, for several auxiliary systems, the applicant credited the Water Chemistry Control Program with managing the loss of material for the stainless steel components exposed to borated water or treated water (including closed-cooling water) without augmentation by an inspection program. By letter dated March 8, 2004, in RAI 3.3-10, the staff asked the applicant to justify the use of the Water Chemistry Control Program without an inspection program to verify its effectiveness for managing the loss of material for stainless steel components.

By letter dated April 7, 2004, the applicant responded by pointing out that NUREG-1801, Section XI.M2, recommends a one-time inspection of selected components at susceptible locations in the system. The applicant stated that it cannot identify any NUREG-1801 recommendation for a one-time inspection of stainless steel auxiliary system group components exposed to borated water or treated water environments.

The applicant also stated that NUREG-1801 recognizes that the preventive nature of the Water Chemistry Control Program is generally considered to be adequate to manage the effects of aging through the period of extended operation for stainless steel components exposed to borated water or treated water, including CCCW. Inspection programs are not considered necessary for all systems and components because of the noncorrosive environments and the corrosion-resistant nature of stainless steels. Therefore, NUREG-1801 does not normally require for stainless steel component types that water chemistry control be augmented by an inspection program. The applicant claimed that its AMR results are consistent with the AMPs recommended by NUREG-1801.

The applicant stated that stainless steel components derive their corrosion resistance from the thin, tightly adherent, passive chromium oxide layer that forms at the component surface. If the environmental conditions are not sufficiently aggressive to penetrate this oxide layer, then no significant corrosion is expected to result. Conversely, if the environment is sufficiently aggressive to disrupt the oxide layer, then localized corrosion may occur.

The applicant further stated that for austenitic stainless steels, penetration of the passive chromium oxide layer and subsequent corrosion has been shown to be principally related to the oxidizing nature of the environment and the presence of specific detrimental ionic species known to interfere with the passivation process (most notably chlorides, sulfates, and fluorides). Appendix A to EPRI TR-1003056 indicates that localized corrosion of stainless steels exposed to treated water (including borated water) is not a significant concern when dissolved oxygen concentrations are less than 100 ppb and concentrations of detrimental ionic species are less than 150 ppb.

Borated Water Environment. NUREG-1801 acknowledges that loss of material due to pitting and crevice corrosion is not an aging effect/mechanism requiring management for stainless steel components exposed to a borated water environment. Specifically, several sections of NUREG-1801 (e.g., Sections V.D1, VII.A3, and VII.E1) conclude that stainless steel components are not subject to significant general, pitting, and crevice corrosion in a borated water environment; therefore, NUREG-1801 does not include these aging mechanisms for this material-environment combination.

The applicant agreed that in the normal borated water environment, stainless steel components are not subject to significant general, pitting, and crevice corrosion. The applicant claimed that it had conservatively identified loss of material due to pitting and crevice corrosion as a potential aging effect that is adequately managed by the Water Chemistry Control Program without supplemental one-time inspections.

The applicant stated that it implements the FNP Water Chemistry Control Program consistent with the PWR primary water chemistry guidelines in EPRI TR-105714. This chemistry control program provides for both a strongly reducing environment via the addition of oxygen scavengers and strict control of detrimental ionic species. These controls limit both dissolved oxygen and detrimental ionic species concentrations to values well below those specified by EPRI TR-1003056.

The applicant also stated that FNP and industrywide operating experience confirm that pitting and crevice corrosion of austenitic stainless steels has not been an issue of concern. Inservice inspections performed at FNP in accordance with Section XI of the ASME Code include numerous inspection locations consisting of the borated water/stainless steel material-environment combination and include normally stagnant and low-flow areas. Inservice inspections include both pipe welds and component internal surfaces. The examinations would identify crevice corrosion or pitting. The applicant has performed these ISIs for many years, and they do not indicate a history of, or susceptibility to, loss of material due to pitting or crevice corrosion.

Treated Water Environment (Reactor Makeup Water System, Demineralized Water System, Sampling System). The applicant clarified that this discussion of treated water includes steam and power conversion systems because portions of the SG blowdown system sample lines are in the scope of the sampling system. The auxiliary systems group includes the sampling system.

The applicant stated that it implements the FNP Water Chemistry Control Program consistent with the guidelines in EPRI EPRI TR-105714 and EPRI TR-102134. The Water Chemistry Control Program provides for strict control of detrimental ionic species concentrations to values well below those specified by EPRI TR-1003056. Sulfates and chlorides are monitored in SG blowdown since SG blowdown provides a reliable indicator of anion content throughout the turbine cycle. Additionally, chloride, fluoride, and sulfate content and total conductivity are monitored at appropriate points during the production of makeup water in the water treatment plant. These controls limit detrimental ionic species concentrations to values well below those specified by EPRI TR-1003056 as contributing to corrosion.

Dissolved oxygen is monitored in the condensate and feedwater systems, CST, reactor makeup water storage tank, and in the water treatment plant during production of demineralized water.

Oxygen scavengers such as hydrazine typically control dissolved oxygen in steam and power conversion systems. In the CST and reactor makeup water storage tank, tank bladders control dissolved oxygen. Dissolved oxygen is expected to be rapidly depleted in stagnant treated water systems; therefore, it is controlled in those systems where a high oxygen concentration could contribute to accelerated corrosion.

The applicant further stated that FNP and industrywide operating experience confirm that pitting and crevice corrosion of austenitic stainless steels has not been an issue of concern. Reviews of FNP operating experience do not indicate a susceptibility to loss of material for stainless steel components in a treated water environment.

Closed-Cycle Cooling Water Environment. The applicant stated that the FNP Water Chemistry Control Program limits chlorides and fluorides in the CCW system to the low range of parts per million. These limits are consistent with the limits provided in EPRI TR-107396, "Closed-Cycle Cooling Water Chemistry Guideline." Chlorides and fluorides are monitored in the EDG jacket water system as an indicator of inleakage. Also, pH in CCCW systems is maintained greater than neutral to reduce the potential for crevice corrosion and pitting by promoting stabilization of the passive oxide layer.

The applicant further stated that dissolved oxygen and sulfates are not monitored or controlled in the CCCW systems. However, these parameters are monitored at appropriate points during the production of makeup water in the water treatment plant. Water treatment plant effluent is also monitored for total conductivity to ensure that unacceptable levels of ionic species are not introduced via makeup water. Finally, any dissolved oxygen introduced via makeup water is expected to be rapidly depleted. Without a significant ingress source, dissolved oxygen concentrations do not require control (EPRI TR-107396).

Control of ionic species which disrupt the passive oxide layer found on stainless steels, monitoring of dissolved oxygen in the makeup water, and pH adjustment effectively eliminate corrosion as an aging effect for stainless steels in these systems.

The applicant stated that FNP and industrywide operating experience confirm that pitting and crevice corrosion of austenitic stainless steels has not been an issue of concern. FNP monitors for corrosion in CCCW systems. Visual inspections of selected components are performed when they are opened for maintenance. These inspections have consistently found no visible corrosion. The applicant indicated that reviews of FNP operating experience do not indicate a susceptibility to loss of material for stainless steel components in a closed-cooling water environment.

The applicant concluded that industry and plant-specific operating history has demonstrated that the Water Chemistry Control Program has effectively controlled loss of material due to corrosion of stainless steel components exposed to borated water, treated water, and closed-cooling water. Therefore additional one-time inspections of stainless steel auxiliary system components for loss of material due to corrosion are not considered necessary.

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3-10 and found the response to be reasonable and acceptable because the applicant has shown that its Water Chemistry Control

Program is consistent with the industry guidelines (EPRI TR-105714, EPRI TR-102134, EPRI TR-107396, and Appendix A to EPRI TR-1003056). In addition, the applicant has indicated that its plant-specific operating experience confirms that pitting and crevice corrosion of austenitic stainless steels has not been an issue of concern in treated water, borated water, and CCCW environments.

Use of One-Time Inspection Program to Manage the Aging Effects of Stainless Steel and Carbon Steel in Raw Water and Lube Oil Environments (RAI 3.3-11)

The loss of material due to general, pitting, and crevice corrosion, MIC and biofouling is a plausible aging effect for stainless steel and carbon steel in the raw water environment or stainless steel exposed to lube oil that may be contaminated with water. In the LRA, the applicant credited the One-Time Inspection Program with managing the loss of material aging effect on stainless steel and carbon steel piping and valve bodies exposed to a raw water environment or stainless steel components exposed to lube oil that may be contaminated with water. However, the staff notes that the One-Time Inspection Program is intended for use as a verification AMP to check the degree of aging of components when significant aging is not expected, while periodic inspections are more appropriate if aging effects can reasonably be expected to occur. By letter dated March 8, 2004, in RAI 3.3-11, the staff asked the applicant to justify why the One-Time Inspection Program is appropriate for managing the identified aging effect.

By letter dated April 7, 2004, the applicant responded by providing the following information. The staff reviewed and evaluated the following:

Stainless Steel Exposed to Lubricating Oil w/ Potential Water Contamination (RCP Oil Collection System):

In Section 3.3 (Aging Management of Auxiliary Systems) of the LRA, SNC credits the One-Time Inspection (OTI) Program to manage stainless steel components in a lubricating oil environment for the RCP oil collection system. The RCP oil collection system is an “open” oil leakage collection system which is designed to collect potential external leakage from the RCP motor lubricating oil system. The RCP oil collection system includes “open” drip pans and therefore the presence of water contamination from the general area environment was assumed to be plausible although significant contamination is not anticipated. Stainless steel is very resistant to general corrosion, pitting, crevice, and MIC, and biofouling is not expected. Additionally, the applicant indicated the FNP operating experience review did not identify any applicable aging issues. Therefore, SNC considers use of the OTI Program for the stainless steel components in the RCP oil collection system appropriate to confirm no significant aging is occurring.

Stainless Steel and Carbon Steel Piping and Valve Bodies Exposed to Raw (Unmonitored) Water Environment

The applicant stated that it credited the One-Time Inspection Program for the following carbon steel and stainless steel components that are exposed to raw water:

- control room air conditioning cooling coil units
- drain piping and valves in the liquid waste and drains system
- piping, valves, and a tank in the potable and sanitary water system

The applicant clarified that these systems operate at low pressure and ambient temperature. While some degree of corrosion is expected in these components, SNC does not expect these components to undergo significant aging that could cause the loss of component intended functions. If SNC discovers significant aging, it will initiate appropriate corrective action to ensure that the intended functions are maintained during the period of extended operation.

Control Room Air Conditioning Cooling Coil Units:

The raw water environment for these units is moisture/condensation that may form on the units. The units are designed for this environment with the selection of materials intended to provide reliable service. The carbon steel that may potentially be wetted is galvanized. The One-Time Inspection Program is appropriate to inspect the unit and confirm significant aging is not occurring.

Drain Piping And Valves In The Liquid Waste And Drains System:

The drain piping and valves in the liquid waste and drains system operate at low pressure and temperature and are used on an intermittent basis. Typically the piping is “dry”, however the LRA environment assumes the most limiting environment of “raw water.” This raw water is better characterized as an “unmonitored and uncontrolled water” source. The One-Time Inspection Program is appropriate to inspect and confirm significant aging is not occurring in the drain piping and valves.

Piping, Valves, and Tank In The Potable And Sanitary Water System:

Although described as “raw water,” the potable and sanitary water system water is “well water or potable water” as described in LRA Table 3.0.4-1. The water is taken from deep wells and run through clarifiers. Operating experience with these types of systems does not indicate SNC should expect significant aging. The One-Time Inspection Program is appropriate to inspect and confirm significant aging is not occurring.

The applicant also stated that these systems operate at low pressure and ambient temperature. While some degree of corrosion is expected in these components, SNC does not expect significant aging to occur. The applicant will use the One-Time Inspection Program to determine if corrosion has occurred during the current operating term to such an extent that additional actions might be required during the renewal term. The applicant stated that such actions could include additional inspections, component replacements, or other appropriate measures.

Staff Evaluation of the Applicant’s Response

The staff reviewed the applicant’s response to RAI 3.3-11 and found the response to issues concerning stainless steel exposed to lubricating oil with potential water contamination (RCP oil collection system) to be reasonable and acceptable because stainless steel is very resistant to general, pitting, and crevice corrosion, and MIC, and because biofouling is not expected. In addition, the FNP operating experience review did not identify any applicable aging issues.

The staff also found the applicant’s response to the issues concerning piping, valves, and tanks in the potable and sanitary water system to be reasonable and acceptable, because the applicant indicated that the water is taken from deep wells and run through clarifiers, and the applicant indicated that, based on operating experience with these types of systems, it does not expect significant aging to occur.

However, in its review of the other parts of the applicant's response to RAI 3.3-11, the staff found that it needed further clarification.

The applicant stated that, for the control room air conditioning cooling coil units, the raw water environment for these units is moisture/condensation that may form on the units. In a telephone conference on April 26, 2004, the staff asked the applicant to clarify whether moisture/condensation coupled with subsequent drying via evaporation/runoff will lead to an ongoing intermittent/periodic wetting/drying environment. If so, the staff asked the applicant to clarify whether the One-Time Inspection Program is appropriate to inspect the unit and confirm that significant aging is not occurring in the control room air conditioning cooling coil units.

The applicant also stated that the components of drain piping and valves in the liquid waste and drains system operate at low pressure and temperature and are used intermittently , and that the raw water is characterized as an unmonitored and uncontrolled water source. In a telephone conference on April 26, 2004, the staff asked the applicant to clarify whether this unmonitored and uncontrolled water source, introduced to these components on an intermittent basis, will lead to an intermittent/periodic wetting/drying environment. If so, the staff asked the applicant to clarify whether the One-Time Inspection Program is appropriate to inspect and confirm that significant aging is not occurring in the drain piping and valves.

In the April 26, 2004, telephone conference and as confirmed in a letter dated May 28, 2004, the applicant responded to the staff's comments described above on the initial response to RAI 3.3-11 with the following supplemental information.

For the control room air conditioning (A/C) cooling coil units (including the drain and loop seal piping), the applicant stated that the control room A/C cooling coil units operate year round with moisture/condensation on the cooling coils expected throughout most of the year because of the normally warm and humid outdoor environment. Drying of the cooling coils occurs when the supply air's dew point is below the coil temperature (typically during colder weather) and also occurs when swapping over to a different cooling unit. As a result, normal operation results in infrequent wet/dry cycling of the cooling coils and associated drain and loop seal piping. The loop seal feature further limits the wet/dry cycling frequency for the in-scope piping.

The applicant indicated that the exposed surfaces of the cooling coil frames are galvanized carbon steel, while the drain and loop seal piping is plain carbon steel. Since wet/dry cycling is infrequent, the loss of material degradation is expected to progress slowly. Cooling coils of similar design (copper alloy tubes with aluminum fins and galvanized steel framing) have proven reliable in A/C applications. The drain and loop seal piping is a 1-1/2-inch, Schedule 40 design. Since the gravity drainlines operate at atmospheric pressure, significant corrosion allowance is available. The applicant stated that a review of the FNP operating experience did not identify any history of corrosion-related failure (i.e., loss of material) for the control room A/C cooling coils or other similar units, or the drain and loop seal piping.

The applicant further stated that it replaced the control room A/C cooling coil units at FNP (circa

1997) as part of an overall upgrade/modification of the control room A/C system. The upgrade/modification replaced the original water-cooled control room A/C units with air-cooled A/C units and included independent refrigeration systems such as cooling coils.

Based on the FNP and industry operating experience to date, the recent replacement of the cooling coils, and the low frequency of wet/dry cycling, the applicant concluded that the selection of the One-Time Inspection Program as the AMP for the control room A/C cooling coils is justified. The applicant stated that it will perform the one-time inspection to confirm that loss of material degradation of the control room A/C cooling coil units is progressing slowly and will not threaten their integrity during the period of extended operation. The applicant will use the One-Time Inspection Program to predict the potential for through-wall leakage occurring in the drain and loop seal piping during the period of extended operation. The inspections will determine the need for corrective actions such as future inspections or repair/replacement.

Finally, the applicant clarified that fouling does not apply to the license renewal component intended function of pressure boundary and therefore should not have been listed.

With respect to the drain piping and valves in the liquid waste and drains system, the applicant emphasized that the liquid waste and drains system operates at low pressures and temperatures (classified as a low-energy system in the CLB). The gravity drainlines operate at atmospheric pressure, and therefore a large corrosion allowance is available. Other in-scope portions are only above atmospheric pressure during sump or transfer pump operation.

The applicant stated that the drain piping components in the liquid waste and drains system are typically dry with a low frequency of wet/dry cycling. These normally dry drains are infrequently exposed to raw water (characterized as unmonitored and uncontrolled water) from draining equipment to support maintenance and from other sources such as abnormal leakage (before corrective maintenance) that is routed to the floor drain. A few drains receive continuous low-volume drainage, such as condensate from air handling units, and therefore are typically partially wetted with a low frequency of wet/dry cycling. Small portions of the system are normally filled, such as pump discharge piping and the drain traps/loop seals.

The applicant also stated that for the stainless steel piping components exposed to raw water, the One-Time Inspection Program will confirm that loss of material is not occurring or is progressing very slowly so as not to affect the component intended function. The use of a one-time inspection (instead of a periodic inspection program) as the AMP is justified based on the inherent corrosion resistance of stainless steels and the supporting operating experience. Stainless steels have provided reliable service in the liquid waste and drains system and similar applications. The applicant stated that the operating experience review (both plant-specific and industrywide) performed in support of the LRA did not identify age-related failures of stainless steels in similar service.

The applicant stated that the FNP carbon steel piping components exposed to raw water are in scope under the 10 CFR 54.4(a)(2) criterion. For the carbon steel piping components exposed to raw water, pressure boundary loss of material is managed by a combination of the One-Time Inspection Program, the External Surfaces Monitoring Program, and the Borated Water Leakage Assessment and Evaluation Program (where components are potentially exposed to borated water leakage). The applicant further stated that it will use the One-Time Inspection Program in areas where a potential spatial interaction exists between a leaking drainline and a safety-related system, structure, or component, such as where a drainline runs over sensitive components, to predict the potential for through-wall leakage occurring during the period of extended operation. The inspections will determine the need for corrective actions such as future inspections or repair/replacement.

The applicant stated that the use of a one-time inspection (and not a periodic inspection program) as the AMP for the carbon steel piping components is justified because it targets the locations where there is potential interaction with sensitive components, and because it has other programs in place that will detect leakage (and initiate corrective action) before a failure of the safety-related system, structure, or component occurs. The AMPs that monitor the exterior of the liquid waste and drain system carbon steel piping components and the AMPs designated in the LRA to monitor the exterior of the safety-related systems, structures, or components (e.g., the External Surfaces Monitoring Program, the Borated Water Leakage Assessment and Evaluation Program, and the Structural Monitoring Program) are reasonably assured to detect leakage before a failure of the safety-related system, structure, or component occurs. The applicant indicated that the FNP operating experience confirms that leakage is readily identified and remedial action taken.

The staff reviewed the applicant's responses and found the responses to be reasonable and acceptable because (1) the applicant used the FNP and industry operating experience to date, the recent replacement of the cooling coils, and the low frequency of wet/dry cycling for the applicable components in the control room A/C cooling coil units (including the drain and loop seal piping) as justification for the use of the One-Time Inspection Program as an AMP; and (2) the applicant clarified that, for the applicable drain piping and valves in the liquid waste and drains system, the piping components are typically dry and are infrequently exposed to raw water from the drains system. The inherent corrosion resistance of the stainless steel components, the use of other programs to detect leakage for the carbon steel piping components, and the FNP's experience also support the applicant's choice of a one-time inspection as the AMP.

Justification of Different AMR Results for the Same Material/Environment Combination (RAI 3.3-12)

In Tables 3.3.2-10 and 3.3.2-11, for copper alloy components exposed to an inside environment, the LRA identified loss of material as the AERM for some components (cooling units) but concluded that there are no aging effects for other components (Pitot tubes). By letter dated March 8, 2004, in RAI 3.3-12, the staff asked the applicant to justify the different AMR results for the same material-environment combination.

By letter dated April 7, 2004, the applicant responded that the AMR for copper alloy components exposed to an inside environment evaluates the potential for water to pool on the surfaces (external) and the likelihood that the components will be wetted. Copper materials that could be exposed to repeated wetting or the pooling of water can experience loss of material.

The applicant further stated that the cooling coils and fins for HVAC units are examples of locations where the external surfaces are likely to be wetted regularly because of condensation. The applicant identified loss of material as an AERM for copper alloy components in an inside environment with a potential for significant wetting or water pooling. The Pitot tubes are an example of a component whose external surface is not likely to be wetted or exposed to pooled water in the inside environment. Thus, SNC has not identified loss of material as an AERM in an inside environment for that component.

Staff Evaluation of the Applicant's Response

The staff has reviewed the applicant's response to RAI 3.3-12 and found it to be reasonable and acceptable because the applicant has clarified the difference in AMR results between the Pitot tubes and the cooling coils and fins for HVAC units in an inside environment.

Measures for Maintaining and Verifying the Dryness Level in the Gas Environment (RAI 3.3-13)

The applicant stated that compressed air system (Table 3.3.2-7) and EDG system (Table 3.3.2-15) components in a dried gas environment have no applicable aging effects. The applicant described a dried gas environment as containing noncondensible vapor with a very limited percentage of moisture present. Dried gases include compressed air (downstream of air dryers) and bottled gases such as carbon dioxide, hydrogen, nitrogen, oxygen, and refrigerants. The staff agrees that the gas is relatively dry and moisture-free. However, moisture present in gas may be a major contributor to aging degradation. By letter dated March 8, 2004, in RAI 3.3-13, the staff asked the applicant to discuss the measures for maintaining and verifying the dryness level in the gas environment, including the acceptance criteria and their bases.

By letter dated April 7, 2004, the applicant responded that dry bottled gases are produced by compressed gas vendors and meet manufacturer's standards as well as industry standards for moisture content. Typical dew points range from -90 °F to -80 °F or approximately 3.5 ppm water vapor to 7.8 ppm water vapor. The applicant also noted that purity levels for bottled gases typically run in the range of 99.50 to 99.999 percent. Impurities represent those constituents in the cylinder that are not pure gas, and a portion of this impurity includes the small amount of water vapor. The applicant claimed that it is evident that the water vapor potential is extremely low for these dry bottled gases and that any moisture carryover into plant systems is insignificant.

The applicant also stated that air dryers are located in compressed air systems to provide dry air for the air distribution network, or in the case of the EDGs, for the air start headers. Air dryers and receivers are natural collection points for moisture and are automatically drained of water and also periodically drained by manual actions to assure that no significant amounts of water enter the systems. The gas is relatively dry and moisture-free downstream of the air dryer.

The applicant stated that it replaces the desiccant in the EDG air start air dryers every 3 months, regardless of condition. The compressed air system has redundant air dryers installed that operate with continuous regeneration and are designed to reduce the dew point of the air to - 40 °F. The dew point is measured on the air dryers every 6 months, and desiccant is inspected and replaced yearly if needed in the compressed air system air dryers. The quality of compressed air is periodically monitored at selected locations. The acceptance criteria for dew point is that it must be at least 18 °F below the minimum temperature to which the instrument air system is exposed.

In summary, the applicant indicated that the operating history at FNP did not indicate any significant aging degradation in systems exposed to a dried gas environment. The design features (dry bottled gases and air dryers), actions taken (monitoring of dew points and replacement of desiccant), and operating history showed that the air systems' internal environment where indicated in the LRA as dried gas is relatively dry and moisture-free and has no applicable AERM for the period of extended operation.

Staff Evaluation of the Applicant's Response

The staff has reviewed the applicant's response to RAI 3.3-13 and found it to be reasonable and acceptable because the applicant clarified that the quality of compressed air is periodically monitored at selected locations and that the operating history at FNP does not indicate any significant aging degradation in systems exposed to a dried gas environment.

Measures for Maintaining and Verifying the Dryness of the Lube Oil Environment (RAI 3.3-14)

For several auxiliary systems such as the oil-static cable pressurization system and EDG system, the applicant concluded that there are no applicable aging effects for components in a lube oil environment. The staff agrees with this position if the lube oil is relatively dry and water-free. However, moisture present in lube oil may be a major contributor to aging degradation. During operations, moisture may accumulate, even though fresh oil may be relatively dry and water-free initially. By letter dated March 8, 2004, in RAI 3.3-14, the staff asked the applicant to describe the measures for maintaining and verifying the dryness of the lube oil, including the acceptance criteria and their bases.

By letter dated April 7, 2004, the applicant responded. The applicant concluded that the lubricating oil environments for the following auxiliary systems (LRA Section 3.3) are not potentially water contaminated:

- open-cycle cooling water—air compressor lubricating oil
- emergency diesel generators—lube oil systems for the emergency diesel generators
- oil-static cable pressurization—oil-static cable pressurization system

The applicant stated that lubricating oil systems are typically closed systems that have little potential for ingress of contaminates unless a component failure occurs. License renewal does not assume component failures as a means to establish the conditions necessary for aging to occur. Water contamination of lubricating oil in a closed lubricating oil system is event-driven and addressed by corrective action. Operating experience at FNP confirms that lubricating oil systems are not susceptible to loss of material caused by water contamination.

The applicant further stated that the activities described below are routine operating and maintenance activities which are not credited as AMPs. Operators check the oil levels daily during their rounds for the affected systems. Gross water contamination of lubricating oil can be visually identified by increased oil level or the oil presenting a milky appearance.

Open-Cycle Cooling Water—Air Compressor Lubricating Oil. The subject air compressors are within the scope of license renewal as part of FNP's 10 CFR 50.48 compliance licensing basis (Appendix R to 10 CFR Part 50, concerning safe shutdown). The lubricating oil in these air compressors is changed annually during the compressor overhaul.

Emergency Diesel Generators—Lube Oil Systems for the Emergency Diesel Generators. The

EDG oil samples are obtained and analyzed with acceptance criteria established in accordance with manufacturer's or user's group recommendations. Lubricating oil may be either reused or replaced with new oil as required by sample results. Operating conditions in the EDGs preclude accumulation of significant moisture in the lubricating oil from environmental sources. The high operating temperature of the EDGs would vaporize any moisture in the oil, and the crankcase vacuum pump would evacuate the moisture. When the EDG is not operating, the keep-warm system maintains the lube oil at temperatures above the ambient conditions.

Oil-Static Cable Pressurization System. The oil-static cable pressurization system is designed to prevent moisture intrusion. The system operates to maintain a continuous pressure of greater than 180 psig downstream of the oil pumps. Upstream of the oil pumps, a nitrogen overpressure of 8 psig is maintained on the storage tanks to prevent intrusion of moisture and other contaminants. Operators monitor both pressures during their rounds, and both have low-pressure alarms to ensure prompt corrective action for low-pressure conditions. There is no credible mechanism for moisture to accumulate in this system. However, moisture content is one of the parameters monitored and trended for this system. Sample results typically run 10 ppm or less.

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3-14 and found the response to be reasonable and acceptable because the applicant has shown that water contamination of lubricating oil in a closed lubricating oil system is event-driven and addressed by corrective action and because operating experience confirms that lubricating oil systems are not susceptible to loss of material caused by water contamination.

Inspections or Monitoring of Heat Exchangers (RAI 3.3-15)

Several auxiliary systems, such as the spent fuel pool cooling and cleanup system, CCCW system, sampling system, and chemical and volume control system, have heat exchangers that are cooled by the CCCW system. It is not clear in the LRA whether the applicant performs inspections and monitoring on the subcomponents (e.g., tubesheets and tubes) exposed to CCCW. By letter dated March 8, 2004, in RAI 3.3-15, the staff asked the applicant to clarify the types of inspections or monitoring that it will perform on the heat exchangers.

By letter dated April 7, 2004, the applicant responded that the LRA 3.3.2-x series of tables provides the specific aging management strategy applied to each auxiliary system heat exchanger component (e.g., tubesheets and tubes, as noted in the tables). The Water Chemistry Control Program manages all heat exchanger components in contact with CCCW. The preventive nature of the Water Chemistry Control Program will adequately manage the effects of corrosion, selective leaching, and cracking throughout the period of extended operation for heat exchanger components exposed to a CCCW environment. While inspections are generally considered unnecessary, the applicant has included the materials most susceptible to corrosion in the CCCW environment within the scope of the One-Time Inspection Program.

The applicant also stated that the scope of the One-Time Inspection Program includes carbon steel, cast iron, and copper alloy components in a CCCW environment, including heat exchanger components, to verify the effectiveness of the Water Chemistry Control Program in managing the loss of material due to corrosion. The applicant deemed that one-time inspections for stainless steel components in a CCCW environment were unwarranted because of the inherent corrosion resistance of stainless steel and the controlled CCCW environment (discussed in the response to RAI 3.3-10).

The applicant indicated that it has performed numerous inspections, both visual and eddy current, on heat exchangers in the CCCW environment. These inspections have not identified any significant age-related degradation from corrosion or cracking. In addition, FNP has an ongoing effort to visually inspect selected CCCW system components when they are opened for maintenance. The applicant claimed that these visual examinations have consistently shown no significant corrosion or other age-related degradation for the CCCW environment.

The applicant stated that its operating experience review for the LRA identified loss of material due to wear for the component CCW heat exchanger tubes. Wear has occurred at the tube-to-support plate interface in the vicinity of the shell-side (CCCW) inlet and outlet. This wear has been attributed to flow-induced vibration of the tubes. In addition to plugging of tubes and operational changes, corrective actions include ongoing ECT of the heat exchanger tubes as part of the Service Water Program.

The applicant clarified that to minimize confusion, the Service Water Program was associated only with the service water side of the CCW heat exchanger tubes in the LRA (Table 3.3.2-5). However, the applicant also credited the Service Water Program with aging management of the CCCW side of the tubes for loss of material due to wear.

The applicant concluded that the plant-specific operating experience confirms that the aging management strategies described are adequate to manage applicable aging effects through the period of extended operation.

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3-15 and found the response to be reasonable and acceptable because the applicant clarified that the Water Chemistry Control Program managed all heat exchanger components in contact with CCCW as provided in the LRA 3.3.2-xx series of tables, and because the applicant included the materials most susceptible to corrosion in the CCCW environment within the scope of the One-Time Inspection Program.

Applicable Aging Effects Requiring Management for Bolting in Auxiliary Systems (RAI 3.3-16)

The LRA does not identify cracking as an applicable AERM for bolting in auxiliary systems. In LRA Table 3.3-1, Item 24 states that cracking is not applicable to bolting because of material selection and sound maintenance practices (control of torque, proper lubricants, and sealing compounds); however, the susceptibility to cracking depends primarily on the bolting material and the operating temperature. To determine that cracking is not an applicable AERM, by letter dated March 8, 2004, in RAI 3.3-16, the staff asked the applicant to identify the bolting materials and the yield strength of the bolting procured for the auxiliary systems within the scope of license renewal and the operating temperatures of the bolting. For high-strength bolting (yield strength greater than 150 ksi), the staff also asked the applicant to provide additional justification for the conclusion that cracking is not an applicable AERM, or to provide an appropriate AMP to manage cracking.

The applicant initially responded to RAI 3.3-16 in a letter dated April 7, 2004. However, in order to address additional bolting materials utilized in the auxiliary systems, by letter dated May 28, 2004, the applicant provided a revised response which supersedes the SNC Letter No. NL-04-0473 dated April 7, 2004.

In its revised response, the applicant stated that stainless steel, carbon steel, alloy steel, and brass bolting materials used in FNP auxiliary systems within the scope of license renewal typically have low operating temperatures; however, some applications (e.g., portions of the chemical volume control and sampling system) can operate at temperatures as high as RCS temperatures.

The bolting materials used in the FNP auxiliary systems bolted connections include the following:

- ASME SA-193 and ASTM A193 Grade B8 (Type 304) stainless steel bolts with a minimum specified yield strength of 30 ksi

- ASME SA-193 and ASTM A193 Grade B6 stainless steel bolts with a minimum specified yield strength of 85 ksi

- ASME SA-453 Grade 660 stainless steel bolts with a minimum specified yield strength of 85 ksi

- ASME SA-307 and ASTM A307 Grade B carbon steel bolts with a maximum specified tensile strength of 100 ksi

- ASME SA-193 and ASTM A193 Grade B7 alloy steel bolts with specified minimum yield strengths up to 105 ksi

- ASTM B-16 brass studs

ASME SA-193 and ASTM A193 Grade B8 stainless steel bolts are used in applications in the OCCW system, CCCW system, control room area ventilation system, primary containment ventilation system, potable and sanitary water system, and reactor makeup water storage system. Because of the low operating temperatures in these systems, these bolts are exposed to operating temperatures well below the 140 °F threshold above which SCC is a concern for stainless steels. These bolts are not high-strength bolts.

ASME SA-193 and ASTM A193 Grade B6 stainless steel bolts are used in applications in the reactor makeup water storage system. Because of the low operating temperatures in this system, these bolts are exposed to operating temperatures well below the 140 °F threshold above which SCC is a concern for stainless steels. These bolts are not high-strength bolts.

ASME SA-453 Grade 660 stainless steel bolts are used in applications in the reactor makeup water storage and liquid waste and drains systems. Because of the low operating temperatures in these systems, these bolts are exposed to operating temperatures well below the 140 °F threshold above which SCC is a concern for stainless steels. These bolts are not high-strength bolts.

ASME SA-453 Grade 660 stainless steel bolts are also used in applications in the chemical and volume control system. These bolts are not high-strength bolts. Depending on the location of specific components, closure bolting in this system could routinely be exposed to temperatures greater than the 140 °F threshold above which SCC is a concern for stainless steels. Austenitic stainless steels are susceptible to SCC when exposed to a corrosive environment that contains aggressive chemical species and moisture and has a material temperature greater than 140 °F. At FNP, the concentration of contaminants in the inside and containment atmosphere environments is not significant because of the lack of sources of contaminants. The atmosphere is therefore extremely mild in terms of corrosion effects for stainless steels, even in areas of high humidity. Standard plant maintenance practices minimize the introduction of contaminants (e.g., chemical product controls), cleanliness controls, and wetting of components (e.g., corrective maintenance to eliminate leaks). These factors effectively control corrosive environments, eliminating SCC as an AERM for stainless steel bolts in the chemical volume and control system. Plant operating experience confirms that SCC of bolting is not occurring at FNP.

ASME SA-307/ASTM A307 Grade B carbon steel bolts are not considered high-strength bolting since the upper limit on tensile strength of 100 ksi assures that the maximum bolt yield strength will be less than 100 ksi. Based on this yield strength, these bolts are not susceptible to SCC in normal PWR environments. Both FNP and industrywide operating experience support this conclusion.

ASME SA-193/ASTM A193 Grade B7 bolts have a minimum specified yield strength of 105 ksi, which is well below the threshold value of 150 ksi. Bolting fabricated in accordance with SA-193 could reasonably be expected to have an actual yield strength less than 150 ksi. However, since no maximum yield strength is specified for this material, it cannot be assured that the actual yield strength will not exceed the 150 ksi limitation for SCC susceptibility set by the staff. The applicant asserted that several mitigating factors exist which, when considered together, indicate that SCC of ASME SA-193/ASTM A193 Grade B7 bolts is not an AERM at FNP.

The applicant also stated that, although there have been isolated instances of SCC of bolting in the industry, these failures primarily resulted from of high yield stress materials (including abnormally high yield stresses resulting from improper heat treatment), excessive bolt preload, and contaminants, such as the use of thread lubricants containing molybdenum sulfide (MoS_2). A review of industry failure databases and NRC generic communications supports the position that a combination of material selection, control of contaminants, and proper maintenance and torquing procedures is effective in eliminating the potential for SCC of bolting materials. These practices are in place at FNP as discussed below:

- material selection—EPRI NP-5769, “Degradation of Bolting in Nuclear Power Plants,” April 1988, indicates that susceptibility to SCC is minimized through selection of materials having specified minimum yield strengths less than 150 ksi. The auxiliary systems bolting materials meet this criteria. ASME SA-193/ASTM A193 Grade B7 bolts have a minimum specified yield strength of 105 ksi, which is below the recommended value of 150 ksi.

- control of contaminants—In general, environmental conditions that could lead to SCC of bolting are not expected to occur in non-Class 1 components. Most bolting at FNP is normally in a dry environment and coated with a lubricant. For bolting located outdoors, the atmosphere is mild in terms of corrosive contaminants (a rural environment remote from coastal regions). Rain tends to wash off contaminants instead of concentrating them. Within the industry, SCC failures of quenched and tempered alloy steel bolting, such as SA-193 Grade B7 bolts, have often been associated with the use of lubricants that may decompose into SCC-inducing contaminants, most notably MoS_2. The applicant has not used lubricants containing MoS_2 and has procedural controls in place at FNP to prevent the use of lubricants containing potentially detrimental species such as chlorides and sulfates.

- control of bolt preload—Excessive bolt stresses have resulted in SCC failures in the industry. Proper control of bolt preload through sound bolt torquing practices has been shown to prevent excessive preload and thereby minimize the potential for SCC failures. Procedural controls in place at FNP ensure the use of proper bolt torquing practices.

The applicant stated that it uses ASME B-16 brass studs in the control room area ventilation system pressurization/filtration and recirculation/filtration units to attach the filter media to the mounting frames. These components are internal to the filtration units, so they are exposed to an inside environment which is the same as the control room air. For these specific components, the atmosphere is air conditioned and filtered. ASME B-16 brass is greater than 15 percent zinc. The SCC of copper alloys is associated with exposure to ammonia and ammonium compounds. At the relatively low operating temperatures in the FNP control room area ventilation system, a high concentration of contaminants would be required to drive SCC as an aging mechanism. The inside environment at FNP does not contain levels of ammonia or ammonium compounds sufficient to drive SCC.

The applicant also noted that it has addressed the potential for SCC of bolting materials at FNP in response to several industry communications, including NRC IE Bulletin 82-02, INPO SOER 84-5, and EPRI guidance documents. For FNP, the bolting materials used, lubricant/contaminant controls employed, and sound bolt torquing practices have been effective in eliminating this aging effect. A review of recent FNP operating history performed for development of the FNP LRA did not identify any instances of SCC in auxiliary systems bolting (which includes ASTM SA-193/ASTM A193 Grade B7 fasteners). In addition, a review of recent NRC generic communications did not identify any recent bolting failures attributable to SCC.

Therefore, the applicant concluded that cracking due to SCC is not an AERM for the stainless steel, carbon steel, alloy steel, and brass bolting materials used in FNP auxiliary systems.

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3-16 and found it to be reasonable and acceptable because the applicant stated that, at FNP, the bolting materials used, lubricant/contaminant controls employed, and sound bolt torquing practices have been effective in eliminating this aging effect. A review of recent FNP operating history performed for development of the FNP LRA did not identify any instances of SCC in auxiliary systems bolting (which includes ASTM SA-193/ASTM A193 Grade B7 fasteners). In addition, a review of recent NRC generic communications did not identify any recent bolting failures attributable to SCC.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, identified under the staff's general RAIs on the AMR issues, that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.1 New Fuel Storage AMR Results

Summary of Technical Information in the Application

In Section 3.3.2.1.1 of the LRA, the applicant stated that it had evaluated new fuel storage as a structural item as part of the auxiliary building in Section 3.5.2.1.2 of the LRA. The applicant noted that it used the Structural Monitoring Program to manage the AERMs for the new fuel storage components and structure.

Staff Evaluation

The staff reviewed Section 3.3.2.1.1, "New Fuel Storage Aging Management Review Results," including the information provided in Item 3.3.1-11 of Table 3.3.1 of the LRA. Section 3.5.2.3.2 of this SER (discussed in the staff review related to the resolution of RAI 3.3-17) provides the staff evaluation of LRA Section 3.3.2.1.1.

The staff finds that the applicant's AMR results for FNP's new fuel storage are consistent with NUREG-1801 and are therefore acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the new fuel storage components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.2 Spent Fuel Storage AMR Results

Summary of Technical Information in the Application

In Section 3.3.2.1.2 of the LRA, the applicant stated that it had evaluated new fuel storage as a structural item as part of the auxiliary building in Section 3.5.2.1.2 of the LRA. The applicant noted that it used the Water Chemistry Control Program to manage the AERMs for the spent fuel storage components and structure.

Staff Evaluation

The staff reviewed Section 3.3.2.1.2, "Spent Fuel Storage Aging Management Review Results," including the information provided in Item 3.3.1-13 of Table 3.3.1 of the LRA. Section 3.5.2.3.2 of this SER (discussed in the staff review related to the resolution of RAI 3.3-17) provides the staff evaluation for LRA Section 3.3.2.1.2.

The staff finds that the applicant's AMR results for FNP's spent fuel storage are consistent with NUREG-1801 and are therefore acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the spent fuel storage components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.3 Spent Fuel Pool Cooling and Cleanup AMR Review

Summary of Technical Information in the Application

In Section 3.3.2.1.3 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the spent fuel pool cooling and cleanup system:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-3 of the LRA, the applicant summarized the AMRs for the spent fuel pool cooling and cleanup system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the spent fuel pool cooling and cleanup system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-3. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the spent fuel pool cooling and cleanup system relating to those combinations of components, materials, environments, and AERMs that the GALL Report does not address. These combinations use notes F through J in LRA Table 3.3.2-3. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs with managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.3 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include heat exchanger (channel head), heat exchanger (tubesheet), heat exchanger (tubes), piping, pump casings, and valve bodies.

For these component types, the applicant identified stainless steel components in borated water and closed-cooling water environments as subject to the aging effect of loss of material. However, stainless steel components exposed to an inside environment experience no aging effect.

The staff reviewed the information in Section 2.3.3.3, Table 2.3.3.3, Section 3.3.2.1.3, and Table 3.3.2-3 of the LRA. The staff determined that it needed additional information to complete its review.

The staff organized its RAIs into general RAIs and system-specific RAIs. The general RAIs applicable to this system include RAIs 3.3-9, 3.3-10, and 3.3-15. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-9, 3.3-10, and 3.3-15. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant’s responses, and the staff’s evaluation of the responses.

On the basis of its review of the LRA and the additional information included in the applicant’s response to the above RAIs, the staff finds that the aging effects of the spent fuel pool cooling and cleanup system component types that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the spent fuel pool cooling and cleanup system.

Aging Management Programs

After evaluating the applicant’s identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-3 of the LRA identifies the Water Chemistry Control Program (Appendix B.3.2) as managing the aging effects described above for the spent fuel pool cooling and cleanup system.

The applicant credited the Water Chemistry Control Program with managing the loss of material aging effect on the stainless steel piping and valve bodies exposed to borated water and treated water (including CCCW). During its review, the staff determined that it needed additional information to complete its evaluation and issued RAI 3.3-10. Section 3.3.2.3.0 describes RAI 3.3-10, the applicant's response to this RAI, and the staff's evaluation of the responses.

The staff's detailed review of this AMP appears in Section 3.0.3.2.1 of this SER.

On the basis of its review of the information provided in the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the spent fuel pool cooling and cleanup system component types that the GALL Report does not address. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the spent fuel pool cooling and cleanup system components that the GALL Report does not address, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.4 Overhead Heavy and Refueling Load Handling System AMR Review

Summary of Technical Information in the Application

In Section 3.3.2.1.4 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the overhead heavy and refueling load handling system:

- Structural Monitoring Program
- Overhead and Refueling Crane Inspection Program

In Table 3.3.2-4 of the LRA, the applicant summarized the AMRs for the overhead heavy and refueling load handling system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the overhead heavy and refueling load handling system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-4. Section 3.3.2.1 of this SER documents the staff's evaluation.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the overhead heavy and refueling load handling system components that are addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.5 Open-Cycle Cooling Water System

Summary of Technical Information in the Application

In Section 3.3.2.1.5 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the OCCW system:

- Service Water Program
- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Buried Piping and Tank Inspection Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-5 of the LRA, the applicant summarized the AMRs for the OCCW system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the OCCW system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-5. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the OCCW system relating to those combinations of components, materials, environments, and AERMs that the GALL Report does not address. These combinations use notes F through J in LRA Table 3.3.2-5. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.5 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include the air compressor lube oil cooler (channel head, shell, tubes/tubesheet), air compressor intercooler, aftercooler, and bleed-off air cooler (channel head, shell, tubes/tubesheet), closure bolting, containment and Engineered safety feature room coolers (channel head and tubes), flow orifice/element, piping, piping with guard pipe, lube and cooling water pump casings, strainers (shell), and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- In an air/gas (wetted) environment, stainless steel and carbon steel components are subject to the aging effect of loss of material.

- Carbon steel components in air/gas environments are also subject to loss of material.

- Stainless steel components in a buried environment are subject to the aging effect of loss of material.

- Carbon steel components in an embedded environment have no applicable aging effects.

- Stainless steel components exposed to inside, outside, or lube oil environments experience no aging effects.

- In an inside environment, copper alloy and cast iron components experience no aging effects.

The staff reviewed the information in Section 2.3.3.5, Table 2.3.3.5, Section 3.3.2.1.5, and Table 3.3.2-5 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized the RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-9, 3.3-14, and 3.3-16.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-9, 3.3-14, and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 describes these RAIs, the applicant's responses, and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff asked the applicant to provide additional information on the issues described in the system-specific RAI 3.3.2.1.5-1. By letter dated April 7, 2004, and as revised by its letter dated March 3, 2005, the applicant responded to this RAI. The following describes RAI 3.3.2.1.5-1, the responses to this RAI, and the staff's evaluation of the responses.

<u>Buried Stainless Steel Piping Not Included in the Scope of the Buried Piping and Tank Inspection Program (RAI 3.3.2.1.5-1)</u>. The LRA states that the applicant uses the Buried Piping and Tank Inspection Program to manage buried carbon steel and buried stainless steel piping in this system. However, the scope of the Buried Piping and Tank Inspection Program includes only buried carbon steel piping and tanks. The staff asked the applicant to clarify which AMP it will use to manage the buried stainless steel piping. If it will use the Buried Piping and Tank Inspection Program, the applicant should provide the appropriate updates to the 10 elements or explain how it will use the GALL program for stainless steel components.

In response, by letter dated April 7, 2004, and as revised by letter dated March 3, 2005, the applicant stated that in addition to buried carbon steel piping and tank components, the Buried Piping and Tank Inspection Program will manage aging in the buried stainless steel and buried copper alloy piping components (fire protection system, LRA Table 3.3.2-13). The applicant agreed that the scope of this program should have included buried stainless steel and copper alloy piping components. The applicant stated that it has updated the Buried Piping and Tank Inspection Program to include buried stainless steel and copper alloy piping components.

The applicant corrected FNP's LRA Appendix A.2.16 and Appendix B.5.4 as follows (***changes are in bold italics***):

LRA Appendix A.2.16—Buried Piping and Tank Inspection Program

The new Buried Piping and Tank Inspection Program will be used to manage the loss of material from external surfaces of ***in-scope*** pressure-retaining buried carbon steel piping and tanks ***and buried stainless steel and copper alloy piping*** during the extended period of operation. Administrative controls and procedures will be put in place to ensure that buried piping and tanks will be inspected when they are excavated for maintenance or when those components are exposed for any reason. This new program will be implemented prior to the period of extended operation.

This program will be consistent with the 10 attributes of the aging management program described in NUREG-1801, Section XI.M34, with the exception that it also includes provisions for inspection of buried stainless steel and copper alloy piping.

LRA Appendix B.5.4—Buried Piping and Tank Inspection Program

B.5.4.1 Program Description

The new FNP Buried Piping and Tank Inspection Program will be used to manage loss of material from the external surfaces of pressure-retaining buried carbon steel piping and tanks ***and buried stainless steel and copper piping components***. Preventive measures have been put in place in accordance with standard industry practices for external coatings and wrappings. Buried piping and tanks will be inspected when they are excavated for maintenance or when those components are exposed for any reason. FNP will implement this new program prior to the period of extended operation.

The scope of the FNP Buried Piping and Tank Inspection Program includes the external surfaces of the following buried components:

- Service water piping
- Emergency diesel generator fuel oil storage tanks and fuel oil transfer piping
- Fire protection piping
- Oil-static Cable Pressurization System buried components from the high voltage to the low voltage switchyard

B.5.4.2 NUREG-1801 Consistency

The FNP program attributes will be consistent with those described in NUREG-1801, Chapter XI.M34 ***except as described in B.5.4.3***.

B.5.4.3 Exceptions to NUREG-1801

Buried stainless steel and copper alloy piping components are also included in the scope of the program. The buried stainless steel and copper alloy components are not normally wrapped or coated, however, these materials have a natural resistance to corrosion in the buried environment.

Inspections are performed when the components are excavated for maintenance or for any other reason including investigation of a potential leak.

For uncoated/unwrapped piping, visual inspection will also be used to examine the external surfaces to confirm that no loss of material has occurred.

Loss of material in piping will be reported and evaluated according to site corrective actions procedures.

B.5.4.4 Enhancements

- None ***(This is a new program.)***

B.5.4.5 Operating Experience

This is a new program. Therefore, no programmatic operating experience has been gained. Leaks in buried piping systems at FNP have typically resulted from localized damage to the external coating/wrapping on carbon steel piping, such as from a rock or mechanical damage during installation. FNP has been successful at detecting these leaks prior to any loss of system function.

B.5.4.6 Conclusion

Implementation of the new FNP Buried Piping and Tank Inspection Program prior to the period of extended operation will provide reasonable assurance that the effects of aging on the pressure-retaining function of those components will be maintained during the period of extended operation.

The staff reviewed the applicant's response to RAI 3.3.2.1.5-1 and found the response to be reasonable and acceptable because the applicant updated the Buried Piping and Tank Inspection Program to include buried stainless steel and copper alloy piping components and provided the complete update of the AMP reflecting the changes.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the OCCW system component types given above that the GALL Report does not address are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the OCCW system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-5 of the LRA identifies the following AMPs for managing the aging effects described above for the OCCW system:

- One-Time Inspection Program (Appendix B.5.5)
- Buried Piping and Tank Inspection Program (Appendix B.5.4)

The applicant uses the One-Time Inspection Program to manage several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program for these different combinations of materials, environments, and AERMs for the components in the OCCW system and finds that this AMP is adequate for managing the identified aging effects because these aging effects are expected to occur at a relatively slow rate.

However, during its review, the staff determined that it needed additional information to complete its evaluation and issued RAI 3.3.2.1.5-1. This RAI, the applicant's responses to this RAI, and the staff's evaluation of the responses are described earlier in this section of the SER.

The staff's detailed review of these AMPs appears in Section 3.0.3.1 of this SER.

On the basis of its review of the LRA and the additional information included in the applicant's response to the RAIs, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the OCCW system component types that the GALL Report does not address. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the OCCW system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.6 Closed-Cycle Cooling Water System

Summary of Technical Information in the Application

In Section 3.3.2.1.6 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the CCCW system:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-6 of the LRA, the applicant summarized the AMRs for the CCCW system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the CCCW system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-6. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the CCCW system relating to those combinations of components, materials, environments, and AERMs that the GALL Report does not address.

These combinations use notes F through J in LRA Table 3.3.2-6. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs with managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.6 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for AMR include closure bolting, flow orifice/element, reactor coolant drain tank heat exchanger (tubes and tubesheet), piping, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs that do not rely on the GALL Report for AMR:

- Stainless steel components in closed-cooling water and borated water environments are subject to the aging effects of loss of material and cracking.

- Stainless steel components exposed to an inside environment experience no aging effects.

The staff reviewed the information in Section 2.3.3.6, Table 2.3.3.6, Section 3.3.2.1.6, and Table 3.3.2-6 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized the RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-9, 3.3-10, 3.3-15, and 3.3-16. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-9, 3.3-10, 3.3-15, and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant's responses, and the staff's evaluation of the responses.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the RAIs, the staff finds that the aging effects of the CCCW system component types that the GALL Report does not address are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the CCCW system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-6 of the LRA identifies the Water Chemistry Control Program (Appendix B.3.2) as managing the aging effects described above for the OCCW system. Section 3.0.3.2.1 of this SER includes the staff's detailed review of this AMP.

The applicant credited the Water Chemistry Control Program with managing the loss of material aging effect on the stainless steel components exposed to borated water or treated water (including closed-cooling water). During its review, the staff determined that it needed additional information and issued RAI 3.3-10. Section 3.3.2.3.0 of this SER describes this RAI, the applicant's responses, and the staff's evaluation of the responses.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the OCCW system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the CCCW system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.7 Compressed Air System

Summary of Technical Information in the Application

In Section 3.3.2.1.7 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the compressed air system:

- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-7 of the LRA, the applicant summarized the AMRs for the compressed air system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the compressed air system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-7. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the compressed air system relating to those combinations of components, materials, environments, and AERMs that the GALL Report does not address. These combinations use notes F through J in LRA Table 3.3.2-7. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs with managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.7 of the LRA lists individual system components within the scope of license renewal and subject to n AMR. The component types that do not rely on the GALL Report for an AMR include air accumulators, filters (casing), piping, fluid traps, and valve bodies.

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For these component types, the applicant identified the following materials, environments, and AERMs:

- Copper alloy, aluminum, and galvanized steel components in an air/gas (wetted) environment are subject to the loss of material.

- Copper alloy and stainless steel components in dried gas and inside environments experience no aging effects.

- Aluminum components in an inside environment and carbon steel components in a dried gas environment have no aging effects.

The staff reviewed the information in Section 2.3.3.7, Table 2.3.3.7, Section 3.3.2.1.7, and Table 3.3.2-7 in the LRA. During its review, the staff determined that it needed additional information.

The staff organized the RAIs into general RAIs and system-specific RAIs. The general RAIs applicable to this system include RAIs 3.3-9 and 3.3-13.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-9 and 3.3-13. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant's responses, and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff asked the applicant to provide additional information on the issues described in the system-specific RAI 3.3.2.1.7-1. By letter dated April 7, 2004, the applicant responded to this RAI. The following describes RAI 3.3.2.1.7-1, the responses to this RAI, and the staff's evaluation of the responses.

<u>Justification for the Use of the One-Time Inspection Program in an Air/Gas (Wetted) Environment (RAI 3.3.2.1.7-1)</u>. The LRA credits the One-time Inspection Program (B.5.5) with managing the aging effect of loss of material of several components in an air/gas (wetted) environment. The staff notes that one-time inspections are used for verification when significant aging is not expected. The staff also observes that for comparable components, materials, environments, and AERMs in the compressed air system, the GALL Report recommends the use of GALL AMP XI.M24, "Compressed Air Monitoring," which uses, in part, periodic inspection

and testing of components. The staff asked the applicant to justify the use of a one-time inspection in lieu of periodic inspection and testing of components for the compressed air system components in an air/gas (wetted) environment.

In response, by letter dated April 7, 2004, the applicant stated that it will use the new FNP One-Time Inspection Program for cases where either (1) an aging effect is not expected to occur but data are insufficient to completely disprove the effect, or (2) an aging effect is occurring slowly enough that it will not affect the component or structure intended function during the period of extended operation, and therefore it does not require additional aging management.

The applicant also stated that the One-Time Inspection Program will provide for an inspection of a sampling of compressed air system components upstream of and including the air dryers to determine if any significant corrosion is occurring within these components. Low points in this portion of the system are routinely drained to prevent moisture accumulation. Loss of material is expected to occur slowly enough that it will not affect the component intended function during the period of extended operation. The program includes an evaluation to determine the need for followup examinations to monitor the progression of any aging degradation found during the inspection.

The applicant noted that in the past, the NRC has accepted one-time inspections in similar environments at the V.C. Summer and Robinson nuclear plants.

The staff reviewed the applicant's response to RAI 3.3.2.1.7-1 and found the response to be reasonable and acceptable because the applicant clarified that the new FNP One-Time Inspection Program will be used for cases where either (1) an aging effect is not expected to occur but the data is insufficient to completely disprove the effect, or (2) an aging effect is occurring slowly enough that it will not affect the component or structure intended function during the period of extended operation, and therefore it does not require additional aging management. The applicant also noted that the NRC has accepted one-time inspections in similar environments at the V.C. Summer and Robinson nuclear plants.

During the scoping review, in a response to RAI 2.3.3.7-4 dated April 22, 2004, the applicant added the stainless steel strainers (element) to Tables 2.3.3.7 and 3.3.2-7. The applicant stated that the One-Time Inspection Program will manage the aging effect of loss of material of the stainless steel strainers exposed to an air/gas (wetted) environment. The staff finds the applicant's response to RAI 2.3.7-4 to be reasonable and acceptable because significant aging is not expected for stainless steel components exposed to an air/gas (wetted) environment.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds the aging effects of the above compressed air system component types that are not addressed by the GALL Report to be consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the compressed air system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-7 of the LRA identifies the One-TIme Inspection Program (Appendix B.5.5) to manage the aging effects described above for the compressed air system.

The applicant uses the One-Time Inspection Program for managing several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program for these different combinations of materials, environments, and AERMs for the components in the compressed air system and finds this AMP adequate for managing the identified aging effects because these aging effects are expected to occur at a relatively slow rate.

Section 3.0.3.1 of this SER provides the staff's detailed review of this AMP.

On the basis of its review of the information provided in the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the compressed air system component types that the GALL Report does not address. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMP credited with managing the compressed air system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMP credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.8 Chemical and Volume Control System

Summary of Technical Information in the Application

In Section 3.3.2.1.8 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the chemical volume and control system:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-8 of the LRA, the applicant summarized the AMRs for the chemical volume and control system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the chemical volume and control system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-8. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the chemical volume and control system relating to those combinations of components, materials, environments, and AERMs that the GALL Report does not address. These combinations use notes F through J in LRA Table 3.3.2-8. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.8 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include regenerative heat exchanger (channel heads, shells, tubes/tubesheet), letdown, excess letdown, and RCP seal water heat exchangers (channel head and tubes/tubesheet), boron thermal regeneration chiller (channel head, tubes/tubesheet), boron thermal regeneration moderating and reheat heat exchanger (channel head and shell, tubes/tubesheet), demineralizers (pressure-retaining components), closure bolting, filters (casing), letdown orifices, piping, boric acid transfer pump casings, boric acid tanks, volume control tank, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- CASS components in a borated water environment are subject to the loss of material.
- Stainless steel components in closed-cooling water and borated water environments are subject to the aging effect of loss of material.
- Stainless steel and CASS components exposed to an inside environment experience no aging effects.
- Stainless steel components in air/gas, dried or wetted (with no oxygen), have no aging effects.

The staff reviewed the information in Section 2.3.3.8, Table 2.3.3.8, Section 3.3.2.1.8, and Table 3.3.2-8 in the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-9, 3.3-10, 3.3-15, and 3.3-16.

By letter dated March 8, 2004, the staff asked the applicant to provide additional information on the issues described in RAIs 3.3-9, 3.3-10, 3.3-15, and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 describes these RAIs, the applicant's responses, and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in the system-specific RAIs 3.3.2.1.8-1 and 3.3.2.1.8-2. By letter dated April 7, 2004, the applicant responded to these RAIs. The following describes RAIs 3.3.2.1.8-1 and 3.3.2.1.8-2, the responses to these RAIs, and the staff's evaluation of the responses.

Applicable Aging Effect for Cast Austenitic Stainless Steel Components in High-Temperature Borated Water Environment (RAI 3.3.2.1.8-1). The loss of fracture toughness/thermal aging embrittlement may be an applicable aging effect for CASS components in a high-temperature borated water environment. The staff asked the applicant to clarify whether this is an applicable aging effect for the CASS components (such as the regenerative heat exchanger) in the chemical volume and control system and, if it is, the staff asked the applicant to provide an AMP.

In response, by letter dated April 7, 2004, the applicant stated that only components operating at temperatures exceeding 482 °F need to be screened for susceptibility to thermal embrittlement. Within the chemical volume and control system, the only austenitic stainless steel castings meeting this operating temperature requirement are the regenerative heat exchanger shells and channel heads.

The applicant further stated in a May 19, 2000, letter from Mr. C.I. Grimes (NRC) to Mr. D.J. Walters (NEI), "License Renewal Issue No. 98-0030, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components," that the staff evaluation outlined an acceptable method for screening CASS components for susceptibility to thermal embrittlement. The applicant applied the screening criteria contained in this staff guideline to the chemical volume and control system regenerative heat exchanger shells and channel heads. These castings were determined to be low in molybdenum content (less than 0.5 percent by weight) and to be centrifugally cast. The applicant determined that, according to the screening criteria contained in Table 2 of the staff guideline, these castings are not susceptible to thermal embrittlement, regardless of casting ferrite number.

The staff reviewed the applicant's response to RAI 3.3.2.1.8-1 and found the response to be reasonable and acceptable because the applicant based its conclusion on the screening criteria contained in Table 2 of the staff guideline outlined in the May 19, 2000, letter.

Stainless Steel Boric Acid Tanks in Air/Gas (Air Space) Environment (RAI 3.3.2.1.8-2). For stainless steel boric acid tanks in an air/gas (air space) environment, the staff asked the applicant to clarify whether the interior surface of the tank is subject to periodic drying and wetting because of fluid level changes. If so, the applicant should clarify whether this may lead to a concentrated level of boric acid, leading in turn to aging degradation, and should provide information on how to manage this aging effect.

In response, by letter dated April 7, 2004, the applicant stated that the chemical volume and control system boric acid tanks utilize a bladder and loop seal design to prevent the ingress of oxygen into the chemical volume and control system. Therefore, fluid level changes do not result in the type of periodic wet/dry cycling that potentially could produce concentrated levels of boric acid. Because of the bladder, the air space of the boric acid tanks is not exposed to wetting with borated water.

Additionally, the applicant stated that the FNP chemical volume and control system boric acid tanks are fabricated from 300-series wrought austenitic stainless steels. Industry material screening tests indicate that this material is relatively unaffected by exposure to boric acid, boric acid spray, and boric acid crystals.

The staff reviewed the applicant's response to RAI 3.3.2.1.8-2 and found the response to be reasonable and acceptable because the applicant uses a bladder and loop seal design in the chemical volume and control system boric acid tanks to prevent ingress of oxygen into the chemical volume and control system and uses 300-series wrought austenitic stainless steels, which are relatively unaffected by exposure to boric acid, as fabrication materials for these tanks.

During the scoping review, in a supplemental response (Part 2) to RAI 2.1-1 dated June 4, 2004, the applicant added the stainless steel tanks (boron concentration meter tanks and chemical mixing tank) to Tables 2.3.3.8 and 3.3.2-8. The original LRA addresses most of the aging effects and AMPs for the added components (e.g., boron concentration meter tanks). The applicant stated that the stainless steel chemical mixing tanks and the associated stainless steel piping and valves exposed to treated water (less than 140 °F) are subject to the loss of material aging effect, and the Water Chemistry Control Program and One-Time Inspection Program will manage this aging effect. The staff finds the applicant's supplemental response (Part 2) to RAI 2.1-1 related to the chemical volume and control system to be reasonable and acceptable because the identified aging effects will be adequately managed.

As a followup to SNC's response to RAI 2.3.3.23-1 provided in SNC Letter No. NL-04-0678 dated April 22, 2004, the staff requested SNC to discuss whether disintegration of the diaphragm membrane can cause blockage of the supply lines from the reactor makeup water storage tanks to the CCW system. In its response dated June 18, 2004, by SNC Letter No. NL-04-1038, the applicant added "tank diaphragms (boric acid tanks)" to Tables 2.3.3.8 and 3.3.2-8. The applicant indicated that elastomers exposed to treated water or air/gas (tank air space) are subject to change in material properties, cracking, and loss of material aging effects. The applicant will use a new AMP, Periodic Surveillance and Preventive Maintenance Activities (B.5.9), to manage the aging effects mentioned above. The staff finds the applicant's followup response to RAI 2.3.3.23-1 to be reasonable and acceptable because this new AMP will provide for periodic component inspections and testing to detect aging effects or component degradation before loss of intended functions occurs.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the chemical volume and control system component types given above that the GALL Report does not address are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the chemical volume and control system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-8 of the LRA and the applicant's followup response, dated June 18, 2004, to RAI 2.3.3.23-1 identify the following AMPs for managing the aging effects described above for the chemical volume and control system:

- Water Chemistry Control Program (Appendix B.3.2)
- One-Time Inspection Program (Appendix B.5.5)
- Periodic Surveillance and Preventive Maintenance Activities (Appendix B.5.9)

The applicant credited the Water Chemistry Control Program with managing several different AERMs. During its review, the staff determined that it needed additional information and issued RAI 3.3-10. Section 3.3.2.3.0 of this SER describes RAI 3.3-10, the applicant's response to this RAI, and the staff's evaluation of the responses.

The applicant uses the One-Time Inspection Program for managing several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program for these different combinations of materials, environments, and AERMs for the components in the chemical volume and control system and finds that this AMP is adequate for managing the identified aging effects because these aging effects are expected to occur at a relatively slow rate.

The Periodic Surveillance and Preventive Maintenance Activities Program is a condition monitoring program. It includes those preventive maintenance and surveillance testing activities credited with managing the aging effects identified in the AMRs. The staff reviewed the utilization of the Periodic Surveillance and Preventive Maintenance Activities Program for the boric acid tank diaphragm inspections for managing change in material properties, cracking, and loss of material on the internal elastomer diaphragms in these tanks. The staff finds this AMP adequate because the applicant stated that the extent and schedule of inspections will assure detection of component degradation before the loss of intended functions occurs.

Sections 3.0.3.2.1, 3.0.3.1, and 3.0.3.3.4 of this SER detail the staff's review of the AMPs.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds the applicant has identified appropriate AMPs for managing the aging effects of the chemical volume and control system component types that the GALL Report does not address. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

<u>Conclusion</u>

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects for the chemical volume and control system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.9 Control Room Area Ventilation System

Summary of Technical Information in the Application

In Section 3.3.2.1.9 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the control room area ventilation system

- One-Time Inspection Program
- External Surfaces Monitoring Program

In Table 3.3.2-9 of the LRA, the applicant summarized the AMRs for the control room area ventilation system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the control room area ventilation system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-9. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the control room area ventilation system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-9. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.9 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include closure bolting, compressible joints and seals, cooling coils (HVAC refrigerant coils and fins), ducts and fittings, equipment frames and housing, fire dampers (frames and housing only), flexible connectors, piping, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Elastomer components exposed to inside and air/gas environments are subject to the aging effects of change in material properties, cracking, and loss of material.

- Copper alloy components exposed to a dried gas or inside environment experience no aging effects.

- Copper alloy components exposed to wetted air/gas or outside environments are subject to the aging effect of loss of materials.
- Aluminum fins exposed to a wetted air/gas environment are subject to loss of material and fouling aging effects.

- Galvanized steel and stainless steel components exposed to an inside or air/gas environment experience no aging effects.

- Carbon steel components exposed to an air/gas environment are subject to the loss of material aging effect.

The staff reviewed the information in Section 2.3.3.9, Table 2.3.3.9, Section 3.3.2.1.9, and Table 3.3.2-9 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized the RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-6, 3.3-7, and 3.3-16.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-6, 3.3-7, and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant's responses, and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff asked the applicant to provide additional information on the issues described in the system-specific RAI 3.3.2.1.9-1. By letter dated April 7, 2004, the applicant responded to this RAI. The following describes RAI 3.3.2.1.9-1, the responses to this RAI, and the staff's evaluation of the responses.

Aging Effect of Aluminum Fins in Heat Exchangers Due to Galvanic Corrosion (RAI 3.3.2.1.9-1). Loss of material due to galvanic corrosion may be a susceptible aging effect on the contact area of aluminum fins and copper tubes of the heat exchangers that are exposed to a wetted air/gas environment. However, it was not clear in the LRA if the One-Time Inspection Program includes galvanic corrosion. The staff asked the applicant to clarify if the One-Time Inspection Program will manage the galvanic corrosion on the contact area of aluminum fins and copper coils.

In response, by letter dated April 7, 2004, the applicant stated that per LRA Table 3.3.2-9, loss of material is an AERM for the aluminum fins, which are in contact with the copper direct expansion cooling tubes inside the control room A/C cooling coils (heat exchangers). Because of the lower galvanic potential of the aluminum fins relative to the copper tubing, the loss of material for the aluminum fins due to galvanic corrosion in the wetted air/gas environment is an AERM in the vicinity where the two materials are in contact. Therefore, the applicant stated that the aluminum fins are conservatively included within the scope of the One-Time Inspection Program for loss of material due to galvanic corrosion. However, the applicant claimed that galvanic corrosion is not expected to be significant. Cooling coils constructed of copper tubes and aluminum fins have proved reliable in HVAC applications. The applicant also stated that it will use the One-Time Inspection Program to verify that significant loss of material is not occurring, including that from galvanic corrosion.

The staff reviewed the applicant's response to RAI 3.3.2.1.9-1 and found the response to be reasonable and acceptable because the applicant clarified that the aluminum fins are conservatively included within the scope of the One-Time Inspection Program for the loss of material due to galvanic corrosion, and that cooling coils constructed of copper tubes and aluminum fins have proved reliable in HVAC applications.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the control room area ventilation system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the control room area ventilation system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement contains an adequate description of the program.

Table 3.3.2-9 of the LRA identifies the following AMPs for managing the aging effects described above for the control room area ventilation system:

- External Surfaces Monitoring Program (Appendix B.5.3)
- One-Time Inspection Program (Appendix B.5.5)

The applicant credited the External Surfaces Monitoring Program with managing the aging effect of loss of material on copper alloy components exposed to an inside environment. The staff reviewed the material, environment, and aging effects on these components, and the adequacy of this AMP for managing the identified aging effects. The staff finds this AMP adequate because it uses periodic inspections of the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted. The applicant has expanded the scope of this AMP to include the flexible connectors and floor drain plug elastomer components, as discussed in the applicant's response to RAI 3.3-6 in Section 3.3.2.3.0 of this SER. The staff notes that, in the original description of the AMP B.5.3 in Section B.5.3.6 of the LRA, the applicant stated that it would also inspect accessible in-scope polymers or elastomers for age-related degradation.

The One-Time Inspection Program manages several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program for these different combinations of materials, environments, and AERMs for the components in the control room area ventilation system and finds this AMP to be adequate for managing the identified aging effects because these aging effects are expected to occur at a relatively slow rate.

The staff's detailed review of these AMPs appears in Sections 3.0.3.3.2 and 3.0.3.1 of this SER, respectively.

On the basis of its review of the information provided in the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the control room area ventilation system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the control room area ventilation system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.10 Auxiliary and Radwaste Area Ventilation System

Summary of Technical Information in the Application

In Section 3.3.2.1.10 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the auxiliary and radwaste area ventilation system:

- One-Time Inspection Program
- External Surfaces Monitoring Program
- Service Water Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-10 of the LRA, the applicant summarized the AMRs for the auxiliary and radwaste area ventilation components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the auxiliary and radwaste area ventilation system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-10. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the auxiliary and radwaste area ventilation system relating to those combinations of components, materials, environments, and AERMs that the GALL Report does not address. These combinations use notes F through J in LRA Table 3.3.2-10. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs with managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.10 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include closure bolting, compressible joints and seals, ducts and fittings, equipment frames and housing, cooling units, fire dampeners (frames and housing only), flexible connectors, flow orifice/element, piping, Pitot tubes, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Elastomer components exposed to inside and air/gas environments are subject to the aging effects of change in material properties, cracking, and loss of material.
- Copper alloy and carbon steel components exposed to an air/gas or inside environment experience no aging effects.
- Copper alloy components exposed to air/gas and inside environments are subject to the aging effect of loss of materials.
- Copper alloy fins exposed to a wetted air/gas environment are subject to the loss of material and fouling aging effects.
- Stainless steel components exposed to an inside or air/gas environment experience no aging effects.
- Galvanized steel components exposed to an inside environment are subject to the aging effect of loss of materials.
- Carbon steel components exposed to an air/gas environment are subject to the loss of material aging effect.

The staff reviewed the information in Section 2.3.3.10, Table 2.3.3.10, Section 3.3.2.1.10, and Table 3.3.2-10 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-6, 3.3-7, 3.3-8, 3.3-12, and 3.3-16. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-6, 3.3-7, 3.3-8, 3.3-12, and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant’s responses, and the staff’s evaluation of the responses.

On the basis of its review of the LRA and the additional information included in the applicant’s response to the above RAIs, the staff finds that the aging effects of the auxiliary and radwaste area ventilation system component types not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the auxiliary and radwaste area ventilation system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-10 of the LRA and the applicant's response to RAI 3.3-6 identify the following AMPs for managing the aging effects described above for the auxiliary and radwaste area ventilation system:

- Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)
- Service Water Program (Appendix B.4.4)
- One-Time Inspection Program (Appendix B.5.5)
- External Surfaces Monitoring Program (Appendix B.5.3)

The applicant credited the Borated Water Leakage Assessment and Evaluation Program with managing the aging effects of loss of material due to boric acid corrosion on carbon steel and galvanized steel components exposed to an inside environment. The staff reviewed the material, environment, and aging effects for these components and this AMP and finds that this AMP is adequate for managing the identified aging effects because it is consistent with the Boric Acid Corrosion Program in the GALL Report. The effectiveness of the latter is consistent with industry experience.

The applicant credited the Service Water Program with managing the aging effect of loss of heat transfer function resulting from fouling on the fins of the cooling units. The staff reviewed the material, environment, and aging effects for these components and this AMP and finds that this AMP is adequate for managing the identified aging effects because it implements NRC GL 89-13 and uses the combinations of periodic flushing and regular heat exchanger cleaning to prevent and mitigate fouling, volumetric examination to detect pipe wall thinning, and visual inspections for fouling and loss of material.

The applicant uses the One-Time Inspection Program for managing several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program for these different combinations of materials, environments, and AERMs for the components in the auxiliary and radwaste area ventilation system and finds that this AMP is adequate for managing the identified aging effects because these aging effects are expected to occur at a relatively slow rate.

The applicant credited the External Surfaces Monitoring Program with managing the aging effect of loss of material on copper alloy components exposed to an inside environment. The staff reviewed the material, environment, and aging effects for these components and the adequacy of this AMP for managing the identified aging effect. The staff finds this AMP adequate because it uses periodic inspections of the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted. The applicant has expanded the scope of this AMP to include the flexible connectors and floor drain plug elastomer components, as discussed in the applicant's response to RAI 3.3-6 in Section 3.3.2.3.0 of this SER. The staff notes that, in the original description of the AMP B.5.3 in Section B.5.3.6 of the LRA, the applicant stated that it will also inspect accessible in-scope polymers or elastomers for age-related degradation.

The staff's detailed review of these AMPs appears in Sections 3.0.3.1.1, 3.0.3.2.5, 3.0.3.1, and 3.0.3.3.2 of this SER, respectively.

On the basis of its review of the information provided in the LRA, the staff finds the applicant has identified appropriate AMPs for managing the aging effects of the auxiliary and radwaste area ventilation system component types not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects, for the auxiliary and radwaste area ventilation system components not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.11 Primary Containment Ventilation System

Summary of Technical Information in the Application

In Section 3.3.2.1.11 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the primary containment ventilation system:

- One-Time Inspection Program
- External Surfaces Monitoring Program
- Service Water Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-11 of the LRA, the applicant summarized the AMRs for the primary containment ventilation system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the primary containment ventilation system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-11. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the primary containment ventilation system relating to those combinations of components, materials, environments, and AERMs not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-11. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs with managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program summaries adequately describe the AMPs.

Aging Effects

Table 2.3.3.11 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include closure bolting, compressible joints and seals, ducts and fittings, equipment frames and housing, cooling coil (fins only), fire dampeners (frames and housing only), flexible connectors, flow orifice/element, piping, Pitot tubes, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Elastomer components exposed to inside and air/gas environments are subject to the aging effects change in material properties, cracking, and loss of material.

- Copper alloy and carbon steel components exposed to air/gas or inside environments experience no aging effects.

- Copper alloy components exposed to air/gas or inside environments experience no aging effects.

- Copper alloy fins exposed to a wetted air/gas environment are subject to loss of material and fouling aging effects.

- Stainless steel components exposed to inside or air/gas environments experience no aging effects.

- Galvanized steel components exposed to an inside environment are subject to the aging effect of loss of materials.

- Carbon steel components exposed to an air/gas environment are subject to the loss of material aging effect.

The staff reviewed the information in Section 2.3.3.11, Table 2.3.3.11, Section 3.3.2.1.11, and Table 3.3.2-11 in the LRA. During its review, the staff determined that it needed additional information.

The staff organized the RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-6, 3.3-7, 3.3-8, 3.3-12, 3.3-14, and 3.3-16. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-6, 3.3-7, 3.3-8, 3.3-12, 3.3-14, and 3.3-16. By letter dated

April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant's responses and the staff's evaluation.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds the aging effects of the above primary containment ventilation system component types that are not addressed by the GALL Report to be consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the primary containment ventilation system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-11 of the LRA and the applicant's response to RAI 3.3-6 identify the following AMPs for managing the aging effects described above for the primary containment ventilation system:

- Service Water Program (Appendix B.4.4)
- One-Time Inspection Program (Appendix B.5.5)
- External Surfaces Monitoring Program (Appendix B.5.3)

The applicant credited the Service Water Program with managing the aging effect of loss of heat transfer function resulting from fouling on the fins of the cooling units. The staff reviewed the material, environment, and aging effects for these components and this AMP and finds that this AMP is adequate for managing the identified aging effects because it implements NRC GL 89-13 and uses the combinations of periodic flushing and regular heat exchanger cleaning to prevent and mitigate fouling, volumetric examination to detect pipe wall thinning, and visual inspections for fouling and loss of material.

The applicant uses the One-Time Inspection Program for managing several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program for these different combinations of materials, environments, and AERMs for the components in the primary containment ventilation system and finds that this AMP is adequate for managing the identified aging effect because these aging effects are expected to occur at a relatively slow rate.

The applicant credited the External Surfaces Monitoring Program with managing the aging effect of loss of material on copper alloy components exposed to an inside environment. The staff reviewed the material, environment, and aging effects for these components and the adequacy of this AMP for managing the identified aging effect. The staff finds this AMP adequate because it uses periodic inspections of the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted. The applicant has expanded the scope of this AMP to include the flexible connectors and floor drain plug elastomer components, as discussed in the applicant's response to RAI 3.3-6 in Section 3.3.2.3.0 of this SER. The staff notes that, in the original description of AMP B.5.3 in Section B.5.3.6 of the LRA, the applicant stated that it will also inspect accessible in-scope polymers or elastomers for age-related degradation.

The staff's detailed review of these AMPs appears in Sections 3.0.3.2.5, 3.0.3.1, and 3.0.3.3.2 of this SER, respectively.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the primary containment ventilation system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects and the AMPs credited with managing the aging effects, for the primary containment ventilation system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.12 Yard Structures Ventilation System

Summary of Technical Information in the Application

In Section 3.3.2.1.12 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the External Surfaces Monitoring Program to manage the aging effects related to the yard structures ventilation system.

In Table 3.3.2-12 of the LRA, the applicant summarized the AMRs for the yard structures ventilation system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the yard structures ventilation system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-12. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the yard structures ventilation system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-12. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs with managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.12 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include ducts and fittings and equipment frames and housing.

For these component types, the applicant noted that galvanized steel components exposed to an air/gas and inside environment do not experience any aging effects.

The staff reviewed the information in Section 2.3.3.12, Table 2.3.3.12, Section 3.3.2.1.12, and Table 3.3.2-12 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-7 and 3.3-9. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-7 and 3.3-9. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant's responses, and the staff's evaluation of the responses.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the yard structures ventilation system component types not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the yard structures ventilation system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-12 of the LRA identifies no AMP for managing the aging effects described above for the yard structures ventilation system.

On the basis of its review of the information provided in the LRA, the staff finds that no AMP is needed for managing the aging effects of the yard structures ventilation system component types that are not addressed by the GALL Report.

<u>Conclusion</u>

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects and no AMP is needed for managing the aging effects for the yard structures ventilation system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.13 Fire Protection System

Summary of Technical Information in the Application

Section 2.3.3.13 of this SER describes the fire protection system. Table 2.3.3.13 of the LRA identifies the passive, long-lived components of this system that are subject to an AMR. A summary of the components, aging effects, and AMPs appears in LRA Tables 3.3.1 and 3.3.2-13. Table 3.3.1 includes references to the RCP oil collection system and fire barriers, although other sections of the LRA address these components.

Aging Effects

Table 2.3.3.13 of the LRA lists the fire protection components that are within the scope of license renewal and subject to an AMR. These components include bolting, fire hydrants, flexible connections, flow orifices, fusible links and sprinkler head bulbs, hose station nozzles and connections, water system piping and valves, gas system piping and valves, fuel oil system piping and valves, pump casings, sight glasses, spray shields, sprinkler heads, strainers, tank protective cover, water system tanks, gas system tanks, fuel oil system tanks, and thermal insulation.

In Section 3.3.2.1.13 and LRA Table 3.3.2-13, the applicant identified the materials, environments, and AERMs. The materials identified include carbon steel, alloy steel, stainless steel, aluminum, cast iron, galvanized steel, lead alloys, and copper alloys. In addition, the applicant addressed a commodity class called “fibers, foams, and ceramics” in Table 3.3.2-13 as applying to thermal insulation on the CO_2 tank. Table 3.3.2-13 identifies ”fusible links and sprinkler heads bulbs” as a component type using the materials of copper alloy; fiber, foams and ceramics; and lead alloys.

The applicant identified the environments to which these materials could be exposed as air and gas (wetted, ambient and dried), raw water (well water), and fuel oil. Section 3.3.2.1.13 of the LRA further identified environments as including inside (with the potential for borated water leakage), outside, and buried.

The applicant identified cracking, loss of material, fouling, and changes in material properties as the aging effects associated with the fire protection system components in LRA Section 3.3.2.1.13.

Aging Management Programs

The LRA identifies the following programs that manage the aging effects related to the fire protection system:

- Fire Protection Program (Appendix B.4.5)
- Fuel Oil Chemistry Control Program (Appendix B.4.2)
- One-Time Inspection Program (Appendix B.5.5)
- External Surfaces Monitoring Program (Appendix B.5.3)
- Buried Piping and Tank Inspection Program (Appendix B.5.4)
- Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)

The sections of LRA Appendix B listed in parentheses above describe these AMPs. The applicant indicated that these AMPs will adequately manage the effects of aging associated with the components of the fire protection system during the period of extended operation.

Staff Evaluation

The staff reviewed the LRA to determine whether the applicant had demonstrated that it would adequately manage the effects of aging for the fire protection system during the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff reviewed Section 3.3.2.1.13 and Tables 3.3.1 and 3.3.2-13 of the LRA for completeness and consistency with the GALL Report and industry experience.

Table 3.3.1 of the LRA includes the RCP oil collection system under Item 3.3.1-6 and references Section 3.3.2.2.6. Item 3.3.1-30 addresses fire barriers and references Section 3.5.

During its review, the staff requested additional information to complete its evaluation of the fire protection portions of the LRA. By letter dated March 23, 2004, the staff issued RAI 2.0-2H (D-RAI 3.3.2.13-1) requesting that the applicant describe the components identified as "spray shields" in Tables 2.3.3.13 and 3.3.2-13 and state where these components are used. In its response dated April 7, 2004, the applicant stated that it uses the spray shields to limit the sprinkler flow to specific targets in the event of a suppression system actuation. These devices are attached to the sprinkler piping and are depicted on the sprinkler system boundary drawings. The response indicated that these shields are constructed of sheet metal, and LRA Table 3.3.2-13 identifies the material as either aluminum or galvanized steel. Based on this information, the staff finds the AMR for these components adequately addressed.

Table 3.3.2-13, under water system piping, identifies cement-lined cast iron piping as not requiring aging management. The applicant based this conclusion on testing it performed on representative samples of the buried piping in 2003. Section 3.3.2.1.13 of the LRA describes the results of this testing and concludes there are no indications of aging effects that would require management for the period of extended operation. The staff concurs that these tests are a valid approach to evaluate the soil conditions that could affect the external surfaces of the piping. Additionally, the water quality and the cement lining of the pipe obviate the need for aging management.

On the basis of its review of the LRA, the staff finds that the aging effects resulting from exposure of the fire protection system components to the environments described in LRA Table 3.3.2-13 are consistent with the GALL Report and with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs, and they are appropriate for the combination of materials and environments listed.

Aging Management Programs

The applicant credited the following AMPs with managing the aging effects in the fire protection system:

- Fire Protection Program (Appendix B.4.5)
- Fuel Oil Chemistry Control Program (Appendix B.4.2)
- One-Time Inspection Program (Appendix B.5.5)
- External Surfaces Monitoring Program (Appendix B.5.3)
- Buried Piping and Tank Inspection Program (Appendix B.5.4)
- Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)

These AMPs are credited with managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them acceptable for managing the aging effects identified for this system. The evaluation of these AMPs appears in Section 3.0.3 of this SER, as indicated above. Table 3.0.3-1 of this SER presents the AMPs credited by the applicant and described in Appendix B to the LRA.

On the basis of its review of the information provided by the applicant, the staff concludes that the applicant has credited the appropriate AMPs with managing the aging effects from the materials and environments associated with the fire protection system and that the AMPs identified above will effectively manage these aging effects.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects and AMPs credited with managing the aging effects for the components of the fire protection system, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.14 Diesel Fuel Oil System

Summary of Technical Information in the Application

In Section 3.3.2.1.14 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the diesel fuel oil system :

- Fuel Oil Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Buried Piping and Tank Inspection Program

In Table 3.3.2-14 of the LRA, the applicant summarized the AMRs for the diesel fuel oil system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the diesel fuel oil system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-14. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the diesel fuel oil system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-14. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects

Table 2.3.3.14 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include piping, guard pipe, pump casings, strainers (element), strainers (shell), tanks, valve bodies, and vent screens.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Carbon steel, alloy steel, copper and Ni-Cu alloys, cast iron, and stainless steel components exposed to a fuel oil environment are subject to the aging effect of loss of material.
- Carbon steel and alloy steel components exposed to an inside environment are subject to the aging effect of loss of material.
- Copper and Ni-Cu alloys, cast iron, and stainless steel components in an inside environment experience no applicable aging effects.
- Stainless steel components in a protective trench experience loss of material.
- Carbon steel and alloy steel components in air/gas environments as well as carbon steel components in an outside environment are subject to the loss of material aging effect.
- Carbon steel components in an embedded environment have no applicable aging effects.

The staff reviewed the information in Section 2.3.3.14, Table 2.3.3.14, Section 3.3.2.1.14, and Table 3.3.2-14 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. The general RAI applicable to this system is RAI 3.3-9.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAI 3.3-9. By letter dated April 7, 2004, the applicant responded to this RAI. Section 3.3.2.3.0 of this SER describes this RAI, the applicant's responses, and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff asked the applicant to provide additional information on the issues described in system-specific RAIs 3.3.2.1.14-1 and 3.3.2.1.14-2. By letter dated April 7, 2004, the applicant responded. Descriptions of RAIs 3.3.2.1.14-1 and 3.3.2.1.14-2, the responses to these RAIs, and the staff's evaluation of the responses appear below.

"Inside—in Protective Trench" vs. Regular "Inside" Environments (RAI 3.3.2.1.14-1). In LRA Table 3.3.2-14 for the diesel fuel oil system, the applicant identified loss of material as the aging effect for carbon steel, alloy steel, and stainless steel pipes exposed to an inside (protective trench) environment. The LRA does not define the protective trench environment. The staff asked the applicant to describe this environment and discuss the differences between it and the regular inside environment (in particular, as related to aging mechanisms and aging effects). For managing this aging effect, the LRA identifies the External Surface Monitoring Program for carbon steel and alloy steel piping, whereas it uses the One-Time Inspection Program for stainless steel piping. The staff asked the applicant to explain the basis for using different AMPs.

In response, by letter dated April 7, 2004, the applicant stated that the piping trenches in the EDG bays are located in the inside environment associated with the diesel generator building. The trenches are recessed in the floor and therefore are a low point that could collect any spills or leaks occurring in the area. Because these piping trenches are covered, the applicant did not perform a visual inspection of the conditions in the trenches before it submitted the LRA. While the piping that runs in these trenches is supported off the floor by spacers at regular intervals, SNC felt it prudent to examine the piping in the trenches to confirm the conditions in the trenches (i.e., to check for evidence of spills or immersion) and any impact on the installed piping. Therefore, the applicant created a distinct environment of "inside—in protective trench" to ensure that the specified AMPs would inspect the condition of the external surfaces of the piping in the trenches.

The applicant also stated in the LRA for mechanical systems that it utilizes the Exterior Surfaces Monitoring Program to inspect carbon and low-alloy steel external surfaces in an inside environment and, therefore, it is appropriate and consistent for managing aging of the external surfaces of the carbon and low-alloy piping in the trenches. However, stainless steel external surfaces in an inside environment do not have an AERM. Stainless steel is inherently corrosion resistant. Therefore, the applicant concluded that the One-Time Inspection Program is appropriate to perform an inspection to confirm that detrimental aging of stainless steel piping in the trenches is not occurring.

The staff reviewed the applicant's response to RAI 3.3.2.1.14-1 and found the response to be reasonable and acceptable because the applicant clarified that it had created a distinct environment of "inside—in protective trench" to ensure that the AMPs specified would inspect the condition of the external surfaces of the piping in the trenches, and that the One-Time

Inspection Program is appropriate to perform an inspection to confirm that detrimental aging of stainless steel piping in the trenches is not occurring. The use of the One-Time Inspection Program is acceptable because stainless steel is inherently corrosion resistant.

Justification for Use of One-Time Inspection for Aging Management of Carbon Steel Components in an Outside Environment (RAI 3.3.2.1.14-2). For the carbon steel vent cap and screen in an outside environment, the LRA credits the One-Time Inspection Program with managing the loss of material. The One-Time Inspection Program is intended for components where no significant aging is expected. Since general corrosion is expected to occur in carbon steel in an outside environment, periodic inspection may be more appropriate than a one-time inspection. The staff asked the applicant to provide additional justification for use of a one-time inspection in lieu of periodic inspection for this component.

In response, by letter dated April 7, 2004, the applicant stated that it agrees that periodic inspection is more appropriate for managing loss of material in carbon steel components exposed to an outside environment. The applicant also agreed that the LRA Table 3.3.2-14 line item for the vent cap and screen is in error.

The applicant stated that the carbon steel vent screen for the diesel generator fuel oil storage tanks has an outside exterior environment. The External Surfaces Monitoring Program will provide periodic inspection of the external surfaces in an outside environment. The interior environment of the vent screen is predominately the same environment as the vapor space of the fuel oil storage tanks. Inspection has shown the vapor space of the fuel oil storage tanks to be free of detrimental aging effects. Therefore, the applicant concluded that a one-time inspection in lieu of periodic inspection is appropriate for the interior of the vent screen component exposed to an air/gas environment.

Based on these considerations, the applicant revised the vent screen line item in LRA Table 3.3.2-14.

The staff reviewed the applicant's response to RAI 3.3.2.1.14-2 and found the response to be reasonable and acceptable because the applicant agreed that periodic inspection is more appropriate for managing loss of material in carbon steel components exposed to an outside environment and has revised the vent screen line item in LRA Table 3.3.2-14, consistent with the above agreement.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the diesel fuel oil system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the diesel fuel oil system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-14 of the LRA identifies the following AMPs for managing the aging effects described above for the diesel fuel oil system:

- Fuel Oil Chemistry Control Program (Appendix B.4.2)
- One-Time Inspection Program (Appendix B.5.5)

The applicant uses the Fuel Oil Chemistry Control Program for managing several different AERMs. The staff reviewed the utilization of the Fuel Oil Chemistry Control Program in these different combinations of materials, environments, and AERMs for the components in the diesel fuel oil system. The staff finds that this AMP is adequate for managing the identified aging effects for two reasons. First, this AMP is consistent with the 10 attributes of the AMPs described in GALL, Section XI.M30, with the exception that the specific ASTM standards that FNP uses as guidelines for sampling and sample analysis are governed by the plant TSs and differ from those cited in the GALL Report. However, no significant difference exists in the ability of the program to manage aging effects. Second, the effectiveness of these GALL AMPs is consistent with industry experience.

The applicant uses the One-Time Inspection Program for managing several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program for the different combinations of materials, environments, and AERMs for the components in the diesel fuel oil system and finds that this AMP is adequate for managing the identified aging effects because they are expected to occur at a relatively slow rate.

The staff's detailed review of these AMPs appears in Sections 3.0.3.2.3 and 3.0.3.1 of this SER, respectively.

On the basis of its review of the information provided in the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the diesel fuel oil system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited with managing the aging effects for the diesel fuel oil system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.15 Emergency Diesel Generator System

Summary of Technical Information in the Application

In Section 3.3.2.1.15 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the EDG system:

- Water Chemistry Control Program
- One-Time Inspection Program
- Service Water Program
- External Surfaces Monitoring Program

In Table 3.3.2-15 of the LRA, the applicant summarized the AMRs for the EDG system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the EDG system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-15. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the EDG system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-15. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.15 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include air accumulators, ducts and fittings, electric heaters, equipment frames and housings, filters (casing), heat exchanger (channel head), heat exchanger (shell), heat exchanger (tubesheet), heat exchanger (tubes), piping, pump casings, strainers (element), strainers (shell), tanks, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Copper alloy and stainless steel components in an air/gas (wetted) environment are subject to cracking and loss of material.

- Copper alloy components in raw water closed-cooling water environments have the aging effects of loss of material, fouling, and leaching, while these components in closed-cooling water environments are subject to the loss of material.

- Carbon steel, copper alloys, cast iron, and stainless steel components exposed to dried gas or lube oil environments have no applicable aging effects.

- Both stainless steel components in an outside environment and copper alloy components subjected to an air/gas environment do not experience any aging effects.

The staff reviewed the information in Section 2.3.3.15, Table 2.3.3.15, Section 3.3.2.1.15, and Table 3.3.2-15 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-9, 3.3-11, 3.3-13, and 3.3-14.

By letter dated March 8, 2004, the staff asked the applicant to provide additional information on the issues described in RAIs 3.3-9, 3.3-11, 3.3-13, and 3.3-14. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describes these RAIs, the applicant's responses and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff asked the applicant to provide additional information on the issues described in system-specific RAIs 3.3.2.1.15-1 and 3.3.2.1.15-2. By letter dated April 7, 2004, the applicant responded to these RAIs. The following describes RAIs 3.3.2.1.15-1 and 3.3.2.1.15-2, the responses to these RAIs, and the staff's evaluation of the responses.

Water Chemistry Control Program Credited for Managing the Aging Effect for Piping Without One-Time Inspection (RAI 3.3.2.1.15-1). The LRA identifies copper alloy in a closed-cooling water environment as subject to the loss of material. For the heat exchanger components (Table 3.3.2-15, p. 3.3-119), the LRA credits the One-Time Inspection Program in conjunction with the Water Chemistry Control Program for aging management. However, for piping (Table 3.3.2-15, p.3.3-122), the LRA only credits the Water Chemistry Control Program. The staff asked the applicant to discuss the different aging management of apparently similar materials, environments, and AERMs.

By letter dated April 7, 2004, the applicant responded by stating that it should have listed the One-Time Inspection Program in conjunction with the water chemistry controls for the EDG cooling water system copper alloy piping and valve bodies in the closed-cooling water environment in Table 3.3.2-15. The applicant agreed that it inadvertently omitted this AMP. The applicant further stated that its aging management results utilize the One-Time Inspection Program to confirm the effectiveness of the Water Chemistry Control Program to control the loss of material for copper alloy components in the CCCW environment.

The staff finds the applicant's response to be reasonable and acceptable because the applicant agreed that it should have listed the One-Time Inspection Program in conjunction with the water chemistry controls, and because the applicant confirmed that its aging management results utilize the One-Time Inspection Program to confirm the effectiveness of the Water Chemistry Control Program to control the loss of material for copper alloy components in the CCCW environment.

Stress-Corrosion Cracking as an Applicable Aging Effect for Stainless Steel Components in the Intake/Exhaust System in the Emergency Diesel Generator System (RAI 3.3.2.1.15-2). Table 3.3.2-15 of the LRA identifies loss of material as the applicable aging effect for most copper alloy or stainless steel components of the EDG system that are exposed to an air/gas (wetted) environment. The LRA credits the One-Time Inspection Program for aging management.

However, for ducts and fittings in the intake/exhaust system, and for the pipes and valve bodies in the air start system, the LRA also identifies cracking as an applicable aging effect and credits the One-Time Inspection Program for aging management. The staff asked the applicant to explain the difference in aging effects for apparently similar material-environment combinations. If the cracking results from cyclic loading of specific components, the applicant should justify the use of the One-Time Inspection Program in lieu of periodic inspections, since such cracking may have a long incubation period.

By letter dated April 7, 2004, the applicant responded by stating that it identified SCC as an AERM for EDG system stainless steel and copper alloy components in an air/gas (wetted) environment subject to elevated temperatures. For stainless steels, the applicant utilized a threshold temperature of 140 °F for susceptibility to SCC.

The applicant further stated that it determined that SCC is a potential aging effect for stainless steels in the EDG exhaust system's air/gas (wetted) environment. The high temperature exhaust gases produce the high elevated temperatures in the air/gas (wetted) environment during EDG operation. These exhaust gases include water vapor and various corrosive combustion products. The applicant does not expect SCC to actually occur, given the limited number of times that each diesel generator is operated over the course of 60 years of plant operation and the proximity of the exhaust temperatures to the threshold temperature for SCC. However, the applicant stated that it does not have sufficient data to rule out the possibility of the aging effect; therefore, it is prudent to perform a one-time inspection to assure that cracking is not occurring.

The applicant further stated that SCC is not an applicable aging effect for the stainless steels in the EDG intake system's air/gas (wetted) environment. The EDG intake system operates at ambient temperatures and is not subject to elevated temperatures. Table 3.3.2-15 of the LRA should not have indicated cracking as an aging effect for the stainless steel ducts and fittings in the EDG intake system.

The applicant stated that it determined that SCC is a potential aging effect for stainless steels and copper alloys in portions of the EDG air start system that are exposed to the air/gas (wetted) environment with elevated temperatures. Specifically, air exiting the compressors will heat the downstream components. The one-time inspection is specifically meant to examine the inlet piping for the air receivers on the 1-2A EDG. The air start subsystem for this diesel generator does not include an after cooler/air dryer assembly. As such, potentially moist air at temperatures above 140 °F could be in contact with the in-scope stainless steel and copper alloy components. While the applicant does not consider SCC likely, the applicant stated that it does not have sufficient data (the removal of the after cooler and air drier is a recent modification) to rule out the possibility; therefore, the applicant stated that it is prudent to perform a one-time inspection to assure that cracking is not occurring.

Staff Evaluation of the Applicant's Response

The staff reviewed the applicant's response to RAI 3.3.2.1.15-2. The staff finds the applicant's response that SCC is not an applicable aging effect for the stainless steels in the EDG intake system's air/gas (wetted) environment to be reasonable and acceptable because the applicant has clarified that the EDG intake system operates at ambient temperatures and is not subject to elevated temperatures. Therefore, LRA Table 3.3.2-15 should not have indicated cracking as an aging effect for the stainless steel ducts and fittings in the EDG intake system. However, regarding the other parts of the applicant's responses, the staff requested the following clarifications in order to complete the review.

For stainless steels, the applicant utilized a threshold temperature of 140 °F for susceptibility to SCC. The applicant stated that the air start subsystem for this diesel generator does not include an after cooler/air dryer assembly. As such, according to the applicant, potentially moist air at temperatures above 140 °F could be in contact with the in-scope stainless steel and copper alloy components. Therefore, using the criterion adopted by the applicant, the component is susceptible to SCC. Yet the applicant considered that in this case SCC is unlikely. In a telephone conference dated April 26, 2004, the staff asked the applicant to justify this conclusion. If the component is susceptible to SCC, and SCC is likely to happen, then the staff asked the applicant to justify the applicability of the One-Time Inspection Program.

The staff also asked the applicant to clarify its statement regarding "the proximity of the exhaust temperatures to the threshold temperature for SCC." In particular, the staff asked the applicant for clarification as to whether the exhaust temperature is above that of the threshold temperature for SCC.

In the April 26, 2004, telephone conference and confirmed in a letter dated May 28, 2004, the applicant responded to these comments regarding its initial response to RAI 3.3.2.1.15-2 dated April 7, 2004. The applicant stated that the revised response to RAI 3.3.2.1.15-2 dated May 28, 2004, supersedes its response in SNC Letter No. NL-04-0473 dated April 7, 2004.

In its response, the applicant stated that the aging effect of cracking identified for the subject components is associated with the aging mechanism of SCC and is not due to cyclic loading. Section 4.3.3 of the LRA addresses fatigue of ASME non-Class 1 components separately as a TLAA.

The applicant utilized a screening threshold temperature of 140 °F for assigning susceptibility to SCC as an aging mechanism (and cracking as the resultant aging effect) for stainless steel. Stainless steels are susceptible to SCC in the presence of detrimental species (e.g., halogens). If oxygen is removed from the environment, cracking only occurs when concentrations of detrimental species are very high. In general, industry experience and laboratory tests indicate that SCC rarely occurs in stainless steels below 140 °F, unless the environment is harsh (e.g., significant contamination with halogens).

The applicant stated that no threshold temperature is associated with the susceptibility of copper alloys to SCC. Copper alloys (brasses) are susceptible to SCC from exposure to ammonia and ammonium compounds. Both oxygen and moisture are necessary for ammonia to be corrosive to copper alloys. Bronzes, with the exception of aluminum bronze, are considered immune to SCC. The applicant concluded that no threshold temperature is associated with the susceptibility of copper alloys to SCC. However, lower contaminant levels are required to initiate SCC in environments with elevated temperatures. The applicant provided the clarifications for the following systems.

<u>Emergency Diesel Generator Exhaust System</u>. The applicant stated that it determined that SCC is a potential aging mechanism/effect for stainless steels in the EDG exhaust system's air/gas (wetted) environment. The air/gas (wetted) environment includes elevated temperatures

(above the 140 °F threshold temperature) during EDG operation produced by the high temperature exhaust gases. These exhaust gases include water vapor and various corrosive combustion products. The applicant does not expect SCC to actually occur, given the successful operating history of stainless steels in exhaust piping applications and the limited operating time for each standby diesel generator. In addition, SNC did not identify any industry or plant-specific operating experience indicative of SCC of stainless steels in a diesel exhaust environment. The EDGs operate on standby, with the actual operating time comprised mainly from surveillance and postmaintenance tests. The applicant clarified that a conservative estimate of the actual operating time for each diesel generator is less than 5 to 10 percent of the time over the course of 60 years, or 3 to 6 years of actual run time.

The applicant concluded that, since operating experience and actual operating time for the EDGs indicate that SCC in the stainless steel exhaust components is unlikely, the use of the One-Time Inspection Program is adequate to assure that cracking is not occurring.

Emergency Diesel Generator Air Start System. The applicant stated that it conservatively determined SCC to be a potential aging mechanism/effect for stainless steels and copper alloys exposed to the air/gas (wetted) environment in portions of the EDG air start system. Only EDG 1-2A has a configuration where the air start system gas is potentially wetted. The air start subsystem for the 1-2A EDG does not include an after cooler/air dryer assembly. The air exiting the compressors is nondried air at elevated temperatures (as a result of the compression) and will heat the downstream components. After the system pressure is achieved, the compressor stops, the components cool down, and moisture can condense within the components. Condensation/moisture is periodically drained from the system low points as part of normal operating practice.

In support of the LRA, the applicant measured the frequency of operation and temperature rise in the 1-2A EDG air start system receiver charging piping. The air start system is operated intermittently during normal operation to maintain the pressure in the air receivers. The intermittent operation of the compressor occurs approximately six times a day, lasts only a few minutes, and raises the temperature just downstream of the compressor to as high as 215 °F, with the downstream temperature at the safety related receiver inlet isolation valve raised to as high as 128 °F. In both locations, the temperature decreases quickly (the piping downstream of the compressor falls below 140 °F in a few minutes) and returns to the ambient room temperature in about 1 hour.

The applicant stated that on occasions such as during maintenance outages (estimated to be once each refueling outage, equivalent to 40 times over a 60-year life), a full recharge of the air receivers may be required. This process takes approximately 1 hour. The manufacturer of the compressor has stated that the discharge temperature of the air from the compressor could be as high as 615 °F during a full recharge of the air receivers. Again, the temperature decreases fairly quickly to room ambient temperatures once the charge is complete.

The applicant further stated that since the temperature exceeded the screening threshold temperature of 140 °F, SCC was conservatively determined to be a potential aging mechanism/effect for the stainless steel components. However, based on operating experience, the air start system is above 140 °F for a very small fraction of the time. Coupled with the absence of any source of contaminants, SNC concluded that SCC of stainless steel in the EDG air start system is very unlikely based on the actual operating conditions for the EDG air start system.

The applicant clarified that the AMR also conservatively determined that SCC of the copper alloys in the EDG air start system downstream of the air receivers was a potential aging mechanism/effect. However, SNC concludes that SCC of copper alloys (brass) in the EDG air start system is very unlikely since there is no known source of ammonia or ammonium compound contaminants.

The applicant concluded that, since the operating conditions (based on operating experience) indicate that SCC in the stainless steel and copper alloys in the EDG air start system is very unlikely, the use of the One-Time Inspection Program is adequate to assure that cracking is not occurring.

The staff reviewed the applicant's responses and found the responses to be reasonable and acceptable because (1) the applicant clarified that its operating experience and actual operating time (5 to 10 percent of the time over the course of 60 years) for the EDGs indicate that SCC in the stainless steel exhaust components is unlikely, and (2) the applicant also clarified that, based on operating experience, the air start system is above 140 °F for a very small fraction of the time and that the system environment does not have any source of contaminants, such that SCC of stainless steel in the EDG air start system is very unlikely based on the actual operating conditions for the EDG air start system.

During the scoping review, in a response to RAI 2.2-5a, the applicant provided an initial response dated April 22, 2004. By letter dated June 10, 2004, the applicant provided a revised response to the telephone conference of May 24, 2004, between SNC and NRC staff. The applicant stated that this revised response supercedes its previous response in SNC Letter No. NL-04-0678 dated April 22, 2004.

The applicant stated in its June 10, 2004, letter that flexible hoses/connections and flexible joints in the OCCW and CCCW systems are made of carbon and stainless steel, are within the scope, and are encompassed in the component type "piping." These components are constructed of the same materials as piping, exposed to the same internal and external environments, experience the same aging affects, and are managed for aging by the same programs. Table 2.3.3.5 for OCCW and Table 2.3.3.6 for CCW include the component type "piping." The intended function is pressure boundary. Table 3.3.2-5 for OCCW and Table 3.3.2-6 for CCCW also include the component type "piping." Materials of construction include both carbon steel and stainless steel.

The applicant further stated that, in the intake/exhaust subsystem of the EDG system, the component type "ducts and fittings" includes the stainless steel expansion joints (as given in the response to RAI 2.3.3.15-3). The original LRA omitted the other flexible hoses/connections and flexible joints in the EDG system that are constructed of elastomers and are within the scope of license renewal. Therefore, the applicant added the component type "flexible connectors" to Tables 2.3.3.15 and 3.3.2-15.

The applicant indicated that flexible connectors exposed to closed-cooling water, air/gas (wetted), lube oil, and inside environments are subject to a change in material properties, cracking, and loss of material. It will manage these aging effects using the External Surface Monitoring Program (Appendix B.5.3). The staff finds the applicant's response to RAI 2.2-5, related to the AMR of the expanded scope, to be reasonable and acceptable because the applicant stated that it will expand the scope of the External Surface Monitoring Program to include elastomer flexible connectors in the EDG system.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of these EDG system component types that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the EDG system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-15 of the LRA and the applicant's response to RAI 2.2-5a identify the following AMPs for managing the aging effects described above for the EDG system:

- Water Chemistry Control Program (Appendix B.3.2)
- One-Time Inspection Program (Appendix B.5.5)
- Service Water Program (Appendix B.4.4)
- External Surfaces Monitoring Program (Appendix B.5.3)

The applicant uses the Water Chemistry Control Program for managing the material aging effect related to several different AERMs. The staff reviewed the utilization of the Water Chemistry Control Program in these different combinations of materials, environments, and AERMs for the components in the EDG system. The staff finds this AMP adequate for managing the identified aging effect because it is consistent both with the 10 attributes of the AMPs described in NUREG-1801, Section XI.M2, and with the 10 attributes of the AMP described in Section XI.M21, with the exception that FNP applies performance monitoring in accordance with the EPRI guidelines for closed-cooling water. The effectiveness of these GALL AMPs is consistent with industry experience.

The applicant uses the One-Time Inspection Program for managing the material aging effect related to several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program in these different combinations of materials, environments, and AERMs for the components in the EDG system. The staff finds this AMP adequate for managing the identified aging effect because these aging effects are expected to occur at a relatively slow rate.

The applicant uses the Service Water Program for managing fouling and loss of material in the service water system and components. The staff reviewed the utilization of the Service Water Program in these different combinations of materials, environments, and AERMs for the components in the EDG system. The staff finds this AMP adequate for managing the identified aging effect because it implements the recommendations of NRC GL 89-13 and is consistent with the 10 attributes of the AMP described in NUREG-1801, Section XI.M20. The effectiveness of this GALL AMP is consistent with industry experience.

The applicant credited the External Surfaces Monitoring Program with managing the aging effect of loss of material on copper alloy components exposed to an inside environment. The staff reviewed the material, environment, and aging effects related to these components and the adequacy of this AMP for managing the identified aging effect. The staff finds this AMP adequate because it uses periodic inspections on the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted. The applicant has expanded the scope of this AMP to include the flexible connectors elastomer components, as discussed in the applicant's response to RAI 2.2-5a. The staff notes that, in the original description of the AMP in LRA Section B.5.3.6, the applicant has stated that it will also inspect accessible in-scope polymers or elastomers for age-related degradation.

Sections 3.0.3.2.1, 3.0.3.1, 3.0.3.2.5, and 3.0.3.3.2, respectively, of this SER document the staff's detailed review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the EDG system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the EDG system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.16 Demineralized Water System

Summary of Technical Information in the Application

In Section 3.3.2.1.16 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the demineralized water system:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Water Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-16 of the LRA, the applicant provided a summary of AMRs for the demineralized water system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the demineralized water system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-16. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMRs of the demineralized water system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-4. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the demineralized water system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-16. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.16 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include piping and valve bodies.

For these component types, the applicant identified that stainless steel components exposed to an inside environment do not experience any aging effects.

The staff reviewed the information in Section 2.3.3.16, Table 2.3.3.16, Section 3.3.2.1.16, and Table 3.3.2-16 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAI 3.3-9 applies to this system. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAI 3.3-9. By letter dated April 7, 2004, the applicant responded to this RAI. Section 3.3.2.3.0 of this SER describes this RAI, the applicant's response, and the staff's evaluation of the response.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAI, the staff finds that the aging effects of the demineralized water system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the demineralized water system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-16 of the LRA does not identify an AMP for managing the aging effects described above for the demineralized water system.

On the basis of its review of the information provided in the LRA, the staff finds that no AMP is needed for managing the aging effects of the demineralized water system component types that are not addressed by the GALL Report.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and that no AMP is needed for managing the aging effects for the demineralized water system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.17 High-Energy Line Break Detection System

Summary of Technical Information in the Application

In Section 3.3.2.1.17 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the high-energy line break isolation system.

In Table 3.3.2-17 of the LRA, the applicant summarized the AMRs for the high-energy line break isolation system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the high-energy line break detection system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-17. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the high-energy line break detection system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-17. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.17 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include piping and valve bodies.

For these component types, the applicant identified that stainless steel components exposed to air/gas and inside environments do not experience any aging effects.

The staff reviewed the information in Section 2.3.3.17, Table 2.3.3.17, Section 3.3.2.1.17, and Table 3.3.2-17 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-7 and 3.3-9. There are no relevant system-specific RAIs for this system.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-7 and 3.3-9. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describe these RAIs, the applicant's responses, and the staff's evaluation of the responses.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the high-energy line break detection system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the high-energy line break detection system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-17 of the LRA identifies no AMP for managing the aging effects described above for the high-energy line break detection system.

On the basis of its review of the LRA, the staff finds that no AMP is needed for managing the aging effects of the high-energy line break detection system component types that are not addressed by the GALL Report.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and that no AMP is needed for managing the aging effects for the high-energy line break detection system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.18 Hydrogen Control System

Summary of Technical Information in the Application

In Section 3.3.2.1.18 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the hydrogen control system:

- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-18 of the LRA, the applicant summarized the AMRs for the hydrogen control system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the hydrogen control system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-18. Section 3.3.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMR of the hydrogen control system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-18. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing the AERMs. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.18 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include equipment frames and housing, filters (casing), flow orifice/element, hydrogen recombiner, piping, air sample analyzer, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Carbon steel in an air/gas environment is subject to the loss of material.

- Stainless steel exposed to air/gas, dried gas, or inside environments do not experience any aging effects.

The staff reviewed the information in Section 2.3.3.18, Table 2.3.3.18, Section 3.3.2.1.18, and Table 3.3.2-18 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAI 3.3-9 applies to this system. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAI 3.3-9. By letter dated April 7, 2004, the applicant responded to this RAI. Section 3.3.2.3.0 of this SER describes this RAI, the applicant's response, and the staff's evaluation of the response.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAI, the staff finds that the aging effects of the hydrogen control system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the hydrogen control system.

Aging Management Program

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-18 of the LRA identifies the One-Time Inspection Program (B.5.5) for managing the aging effects described above for the hydrogen control system.

The applicant uses the One-Time Inspection Program for managing the aging effect of loss of material for carbon steel exposed to an air/gas environment in the hydrogen control system. The staff finds this AMP adequate for managing the identified aging effect because this aging effect is expected to occur at a relatively slow rate.

Section 3.0.3.1 of this SER provides the staff's detailed review of this AMP.

On the basis of its review of the LRA, the staff finds that the applicant has identified an appropriate AMP for managing the aging effects of the hydrogen control system component types that are not addressed by the GALL Report. In addition, the staff finds the program description in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effect, and the AMP credited for managing the aging effect, for the hydrogen control system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMP credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.19 Liquid Waste and Drains

Summary of Technical Information in the Application

In Section 3.3.2.1.19 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the liquid waste and drains:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Water Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-19 of the LRA, the applicant summarized the AMRs for the liquid waste and drains components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the liquid waste and drains system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-19. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the liquid waste and drains system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-19. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.19 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include closure bolting, flexible connectors, floor drain plug, piping, tanks and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Elastomer components exposed to inside or wetted air/gas environments are subject to the aging effects of change in material properties, cracking, and loss of material.

- Carbon steel and alloy steel components exposed to wetted air/gas, lube oil, inside, or raw water environments are subject to the loss of material aging effect.

- Galvanized steel exposed to wetted air/gas or inside environments are subject to the loss of material aging effect.

- Stainless steel components exposed to lube oil, borated water, or raw water environments are subject to the loss of material aging effect.

- Stainless steel components exposed to inside environments experience no aging effects.

The staff reviewed the information in Section 2.3.3.19, Table 2.3.3.19, Section 3.3.2.1.19, and Table 3.3.2-19 in the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-6, 3.3-10, 3.3-11, and 3.3-16.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-6, 3.3-10, 3.3-11, and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describe these RAIs, the applicant's responses and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in system-specific RAI 3.3.2.1.19-1. By letter dated April 7, 2004, the applicant responded to this RAI. The following describes RAI 3.3.2.1.19-1, the responses to this RAI, and the staff's evaluation of the responses.

<u>Cracking Initiation and Growth Not Identified as a Plausible Aging Effect for Stainless Steel Components Exposed to Borated Water Environment (RAI 3.3.2.1.19-1)</u>. Crack initiation and growth are plausible aging effects for stainless steel components exposed to a borated water environment. However, LRA Table 3.3.2-19 did not identify this as a plausible aging effect for stainless steel piping and valve bodies. The staff asked the applicant to provide the technical basis for excluding these plausible aging effects.

In response, by letter dated April 7, 2004, the applicant stated that it applied a conservative threshold temperature of 140 °F for the initiation of SCC in austenitic stainless steel components exposed to borated water. Extensive industry data based on actual operating experience and laboratory testing indicate that initiation of SCC is unlikely to occur at temperatures less than 140 °F unless the materials are sensitized and exposed to harsh marine wet/dry cycling conditions. This SCC threshold limit is consistent with EPRI TR-1003056.

The applicant further stated that the in-scope liquid waste and drains components exposed to a borated water environment operate at temperatures less than the 140 °F threshold temperature and, therefore, the applicant did not include this aging effect in Table 3.3.2-19.

The staff reviewed the applicant's response to RAI 3.3.2.1.19-1 and found the response to be reasonable and acceptable because the applicant indicated that in-scope liquid waste and drains components exposed to a borated water environment operate at temperatures less than the 140 °F threshold temperature, and this threshold temperature for the occurrence of SCC is consistent with industry data and experience.

During the scoping review, in a response to RAI 2.3.3.19-4, the applicant added two portions of the drainline in the liquid waste and drains system. One portion of the drainline is made from cast iron, and the remainder, where the line enters the sump, is made from the stainless steel. Both portions of the drainline are embedded in concrete. The applicant stated that its evaluation did not identify any credible aging effects that could potentially result in a failure of the drain piping and surrounding concrete to direct flow to the sump. Therefore, no additional AMPs are required. The applicant revised LRA Table 3.3.2-19 to reflect the above changes in scope for the AMR. The staff finds the applicant's response to RAI 2.3.3.19-4, with respect to an AMR, to be reasonable and acceptable because (1) the drainline is sloped to prevent water pooling, (2) leakage in the room is normally insignificant, and (3) this line is dry during normal operating conditions.

During the scoping review, in a supplemental response (Part 2) to RAI 2.1-1 dated June 4, 2004, the applicant added component types, including drain bodies and pump casings, to LRA Table 2.3.3.19 and added tanks (waste holdup and floor drain tanks), piping and components (drain piping, including floor drain bodies), pump casings (sump pumps), and drain bodies (roof drains) to LRA Table 3.3.2-19.

For these component types, the applicant identified additional materials, environments, and AERMs. Stainless steel components exposed to raw water (including untreated), cast iron components exposed to an outside environment, or stainless steel and copper alloys components exposed to an air/gas (wetted) environment are subject to the loss of material aging effect. For these component types, the applicant uses the One-Time Inspection Program to manage this aging effect. The applicant also noted that the stainless steel and copper alloys components exposed to an inside environment, or cast iron components exposed to an embedded environment, experience no aging effects and require no AMPs.

The staff finds the applicant's supplemental response (Part 2) to RAI 2.1-1, related to liquid waste and drains including roof drains and sanitary drains, to be reasonable and acceptable because all the identified aging effects will be adequately managed.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the liquid waste and drains component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above liquid waste and drains components.

Aging Management Programs

After evaluating the applicant’s identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-19 of the LRA identifies the following AMPs for managing the aging effects described above for liquid waste and drains components:

- Water Chemistry Control Program (Appendix B.3.2)
- Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)
- External Surfaces Monitoring Program (Appendix B.5.3)
- One-Time Inspection Program (Appendix B.5.5)

The applicant credited the Water Chemistry Control Program with managing the loss of material in the stainless steel piping and valve bodies exposed to borated water. During its review, the staff determined that it needed additional information and requested it in RAI 3.3-10. Section 3.3.2.3.0 of this SER describes RAI 3.3-10, the applicant’s response to this RAI, and the staff’s evaluation of the responses.

The applicant credited the Borated Water Leakage Assessment and Evaluation Program with managing effects of the loss of material due to boric acid corrosion on carbon steel or alloy steel components exposed to an inside environment. The staff reviewed the material, environment, and aging effects on these components and finds that this AMP is adequate for managing the identified aging effects because it is consistent with the Boric Acid Corrosion Program in the GALL Report. The effectiveness of the GALL program is consistent with industry experience.

The applicant credited the External Surfaces Monitoring Program with managing the loss of material on carbon steel or alloy steel components exposed to an inside environment. The staff reviewed the material, environment, and aging effects on these components, as well as the adequacy of this AMP to manage the identified aging effect. The staff finds this AMP adequate because it uses periodic inspections on the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted. The applicant has expanded the scope of this AMP to include the flexible connectors and floor drain plug elastomer components, as discussed in the applicant’s response to RAI 3.3-6 in Section 3.3.2.3.0 of this SER. The staff notes that, in the original description of the AMP in LRA Section B.5.3.6, the applicant stated that it will also inspect the accessible in-scope polymers or elastomers for age-related degradation.

The applicant used the One-Time Inspection Program to manage material aging effects related to several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program in these different combinations of materials, environments, and AERMs for the liquid waste and drains components and finds this AMP adequate for managing the identified aging effect because these aging effects are expected to occur at a relatively slow rate.

Sections 3.0.3.2.1, 3.0.3.1.1, 3.0.3.3.2, and 3.0.3.1 of this SER, respectively, provide the staff’s detailed review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the liquid waste and drains component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the liquid waste and drains components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.20 Oil-Static Cable Pressurization System

Summary of Technical Information in the Application

In Section 3.3.2.1.20 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the oil-static cable pressurization system:

- External Surfaces Monitoring Program
- Buried Piping and Tank Inspection Program

In Table 3.3.2-20 of the LRA, the applicant summarized the AMRs for the oil-static cable pressurization components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the oil-static cable pressurization system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-20. Section 3.3.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMR of the oil-static cable pressurization system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-20. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.20 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include piping, pump casings, tanks, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Carbon steel exposed to buried, inside, and outside environments is subject to the loss of material.
- Elastomers exposed to an inside environment are subject to a change in material properties, cracking, and loss of material.
- Copper alloy exposed to an outside environment is subject to a loss of material.

The LRA does not identify any AERMs for carbon steel exposed to dried gas or lube oil; stainless steel exposed to dried gas, lube oil, or inside environments; copper alloy exposed to lube oil or inside environments; or elastomers exposed to dried gas.

The staff reviewed the information in Section 2.3.3.20, Table 2.3.3.20, Section 3.3.2.1.20, and Table 3.3.2-20 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-9, 3.3-11, and 3.3-14. There are no relevant system-specific RAIs.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-9, 3.3-11, and 3.3-14. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER provides these RAIs, the applicant's responses, and the staff's evaluation of the responses.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the oil-static cable pressurization system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the oil-static cable pressurization system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-20 of the LRA identifies the following AMPs for managing the aging effects described above for the oil-static cable pressurization system:

- External Surfaces Monitoring Program (Appendix B.5.3)
- Buried Piping and Tank Inspection Program (Appendix B.5.4)

The applicant credited the External Surfaces Monitoring Program with managing the loss of material on carbon steel, or alloy steel components exposed to inside and outside environments. It is also credited with managing the loss of material, cracking, and changes in material properties in elastomer flexible hoses used in the oil-static cable pressurization system. The staff reviewed the material, environment, and aging effects related to these components and the adequacy of this AMP for managing the identified aging effect. The staff finds this AMP adequate because it uses periodic inspections of the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted.

The applicant credited the Buried Piping and Tank Inspection Program with managing the loss of material on carbon steel components exposed to a buried environment. The staff reviewed the material, environment, and aging effects related to these components and the adequacy of this AMP for managing the identified aging effect. The staff finds this AMP adequate because it is consistent with NUREG-1801, Section XI.M34, with the exceptions that were found to be acceptable in Section 3.3.2.3.5 of this SER.

Sections 3.0.3.3.2 and 3.0.3.2.10 (see also 3.3.2.3.5) of this SER, respectively, provide the staff's detailed review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the oil-static cable pressurization system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the oil-static cable pressurization system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.21 Potable and Sanitary Water System

Summary of Technical Information in the Application

In Section 3.3.2.1.21 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the potable and sanitary water system:

- One-Time Inspection Program
- External Surfaces Monitoring Program

In Table 3.3.2-21 of the LRA, the applicant summarized the AMRs for the potable and sanitary water system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the potable and sanitary water system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-21. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the potable and sanitary water system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-21. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.21 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for AMR include closure bolting, heat exchanger (channel head), heat exchanger (shell), piping, strainers, tanks, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Alloy steel components exposed to an inside environment are subject to the aging effect of loss of material.

- Copper alloy components exposed to a raw water environment are subject to the loss of material aging effect.

- Carbon steel components exposed to treated water or inside environments are subject to the loss of material aging effect.

- Stainless steel components exposed to a raw water environment are subject to the loss of material aging effect.

- Stainless steel exposed to an inside environment experiences no aging effects.

The staff reviewed the information in Section 2.3.3.21, Table 2.3.3.21, Section 3.3.2.1.21, and Table 3.3.2-21 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-11 and 3.3-16.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-11 and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describe these RAIs, the applicant's responses, and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in system-specific RAI 3.3.2.1.21-1. By letter dated April 7, 2004, the applicant responded to this RAI. The following describes RAI 3.3.2.1.21-1, the responses to this RAI, and the staff's evaluation of the responses.

Selective Leaching Not Identified as a Plausible Aging Effect for Copper Alloy Components Exposed to Raw Water (RAI 3.3.2.1.21-1). Selective leaching is a plausible aging effect for copper alloy components exposed to raw water. However, LRA Table 3.3.2-21 does not identify this aging effect for the potable and sanitary water system for the copper alloy piping and valve bodies exposed to raw water. The staff asked the applicant to provide the technical basis for excluding this aging effect.

By letter dated April 7, 2004, the applicant responded. Selective leaching is the removal of one element from a solid alloy by corrosion processes, such as the removal of zinc from brass alloys. Copper alloys containing zinc in quantities greater than 15 percent are susceptible to selective leaching. The addition of small amounts of alloying elements such as tin also inhibit selective leaching.

The applicant stated that it purchased the copper alloy piping exposed to raw water in the potable and sanitary water system to ASTM B-88, Type L, specifications. This material is 99.9 percent copper, which is not susceptible to selective leaching.

The applicant further stated that it purchased the copper alloy valve bodies exposed to raw water in the potable and sanitary water system to ASTM B-62 specifications. This material contains zinc in quantities of less than 15 percent (specification is 4.0–6.0 percent). The inclusion of 4.0–6.0 percent tin also inhibits this effect in this material. Therefore, the applicant concluded that these valve bodies are not susceptible to selective leaching.

In summary, the applicant stated that the copper alloy piping and valve bodies in the potable and sanitary water system that are exposed to raw water are not susceptible to selective leaching; therefore, the applicant did not identify this aging effect in LRA Table 3.3.2-21.

The staff finds the applicant's response to RAI 3.3.2.1.21-1 to be reasonable and acceptable because the applicant has clarified that the composition of the copper-based materials is such that they are not susceptible to selective leaching when exposed to raw water.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the potable and sanitary water system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the potable and sanitary water system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-21 of the LRA identifies the following AMPs for managing the aging effects described above for the potable and sanitary water system:

- External Surfaces Monitoring Program (Appendix B.5.3)
- One-Time Inspection (Appendix B.5.5)

The applicant credited the External Surfaces Monitoring Program with managing the loss of material on carbon steel components exposed to an inside environment. The staff reviewed the material, environment, and aging effects related to these components and finds this AMP adequate for managing the identified aging effect because it uses periodic inspections on the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted.

The applicant uses the One-Time Inspection Program to manage the material aging effect related to several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program in these different combinations of materials, environments, and AERMs for the components in the portable and sanitary water system and finds that this AMP, is adequate for managing the identified aging effect because these aging effects are expected to occur at a relatively slow rate.

Sections 3.0.3.3.2, and 3.0.3.1 of this SER, respectively, detail the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the potable and sanitary water system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the potable and sanitary water system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.22 Radiation Monitoring System

Summary of Technical Information in the Application

In Section 3.3.2.1.22 of the LRA, the applicant stated that it included radiation monitoring system mechanical components requiring AMR as part of the LRA systems for the process and effluents being monitored.

Staff Evaluation

In Section 2.3.3.22 of the LRA, the applicant stated that no components are subject to an AMR for the radiation monitoring system. Section 2.3.3.22 of this SER details the staff's evaluation on the discussion of scoping and screening results for the radiation monitoring system.

Conclusion

Section 2.3.3.22 of this SER details the staff's evaluation of the radiation monitoring system.

3.3.2.3.23 Reactor Makeup Water Storage System

Summary of Technical Information in the Application

In Section 3.3.2.1.23 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the reactor makeup water storage system:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-23 of the LRA, the applicant summarized the AMRs for the reactor makeup water storage system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the reactor makeup water storage system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-23. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the reactor makeup water storage system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-23. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.23 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include closure bolting, flow orifice/element, piping, pump casings, tanks, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Alloy steel and carbon steel components exposed to inside or outside environments are subject to the loss of material.

- Carbon steel components exposed to a treated water environment are subject to the loss of material.

- Stainless steel components exposed to a treated water environment are subject to the loss of material.

- Stainless steel components exposed to inside or outside environments experience no aging effects.

The staff reviewed the information in Section 2.3.3.23, Table 2.3.3.23, Section 3.3.2.1.23, and Table 3.3.2-23 of the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-10, 3.3-11, and 3.3-16.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-10, 3.3-11, and 3.3-16. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describe these RAIs, the applicant's responses and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in system-specific RAI 3.3.2.1.23-1. By letter dated April 7, 2004, the applicant responded to this RAI. The following describes RAI 3.3.2.1.23-1, the response to this RAI, and the staff's evaluation of the response.

<u>Exclusion of the SCC Aging Effect for Stainless Steel or Carbon Steel Components Exposed to Treated Water (RAI 3.3.2.1.23-1)</u>. Crack initiation and growth due to SCC may be a plausible aging effect on stainless steel and carbon steel exposed to treated water. However, the LRA does not identify this aging effect on any of the stainless steel or carbon steel components exposed to treated water in the reactor makeup water storage system. The staff asked the applicant to provide the technical basis for excluding this aging effect for the stainless steel or carbon steel components exposed to treated water.

By letter dated April 7, 2004, the applicant responded to RAI 3.3.2.1.23-1 by providing the following information.

Stainless Steel

The applicant stated that it applies a conservative threshold temperature of 140 °F for the initiation of SCC in stainless steel components exposed to borated water. Extensive industry data based on actual operating experience and laboratory testing indicate that the initiation of SCC is unlikely to occur at temperatures less than 140 °F unless the materials are sensitized and exposed to harsh marine wet/dry cycling conditions. This SCC threshold limit is consistent with EPRI TR-1003056.

The applicant further stated that the Water Chemistry Control Program manages the reactor makeup storage water system borated water chemistry, which operates at temperatures less than 140 °F. Therefore, the applicant concluded that SCC is not a potential aging mechanism for stainless steel components in this system.

Carbon Steel

The applicant stated that, for carbon steel and alloy steel, EPRI TR-1003056 only identifies SCC as potential aging mechanism when nitrate corrosion inhibitors are utilized. However, FNP does not use nitrate inhibitors in the reactor makeup water system (treated water environment). Therefore, the applicant concluded that SCC is not a potential aging mechanism for carbon and alloy steel components in this system.

The staff reviewed the applicant's response to RAI 3.3.2.1.23-1 and found it to be reasonable and acceptable because the applicant clarified that (1) the reactor makeup storage water system borated water operates at temperatures less than 140 °F, the threshold temperature for the initiation of SCC in stainless steel components exposed to borated water, which is consistent with industry data based on actual operating experience and laboratory testing, and (2) FNP does not use nitrate inhibitors in the reactor makeup water system (treated water environment).

As a follow-up to SNC's response to RAI 2.3.3.23-1 provided in SNC Letter No. NL-04-0678 dated April 22, 2004, the staff requested SNC to discuss whether disintegration of the diaphragm membrane can cause blockage of the supply lines from the reactor makeup water storage tanks to the CCW system. In its response dated June 18, 2004, by SNC Letter No. NL-04-1038, the applicant added tank diaphragms (reactor makeup water storage tanks) to Tables 2.3.3.23 and 3.3.2-23. The applicant indicated that elastomers exposed to treated water or air/gas (tank air space) are subject to a change in material properties, cracking, and loss of material. The applicant will use a new AMP, Periodic Surveillance and Preventive Maintenance Activities (B.5.9) to manage these aging effects. The staff finds the applicant's follow-up response to RAI 2.3.3.23-1 to be reasonable and acceptable because this new AMP will provide for periodic component inspections and testing to detect aging effects or component degradation before the loss of intended functions occurs.

As a result of the scoping and screening inspection conducted by NRC Region II from May 10–14, 2004, and documented in NRC Inspection Reports 50-348/2004-07 and 50-364/2004-07, dated June 22, 2004, the inspectors noted that the scope of license renewal did not include the atmospheric vents on several tanks. In its letter dated July 9, 2004, the applicant included the vents for the reactor makeup water storage tanks within the scope of license renewal and added the stainless steel reactor makeup water storage tank (including tank vent) into LRA Table 3.3.2-23 for an AMR. The applicant stated that, for the reactor makeup water storage tanks which have internal diaphragms, it applied the air/gas (nonwetted) environment to these vents because they are not exposed to high moisture (humidity) from the tank's water contents because of the protective internal diaphragm. The applicant concluded that there is no aging effect for this material-environment combination for this component; therefore, it requires no AMP. Because stainless steel components exposed to nonwetted air/gas environments do not experience any AERMs, the staff finds the applicant's assessment of the aging effects related to this added component to be reasonable and acceptable.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects of the reactor makeup water storage system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the reactor makeup water storage system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-23 of the LRA and the applicant's follow-up response, dated June 18, 2004, to RAI 2.3.3.23-1 identify the following AMPs for managing the aging effects described above for the reactor makeup water storage system:

- Water Chemistry Control Program (Appendix B.3.2)
- External Surfaces Monitoring Program (Appendix B.5.3)
- One-Time Inspection (Appendix B.5.5)
- Periodic Surveillance and Preventive Maintenance Activities (Appendix B.5.9)

The applicant credited the Water Chemistry Control Program with managing the loss of material aging effect on the stainless steel piping, flow elements, orifices, and valve bodies exposed to treated water. During its review, the staff determined that it needed additional information, requested in RAI 3.3-10. Section 3.3.2.3.0 of this SER describes RAI 3.3-10, the applicant's response to this RAI, and the staff's evaluation of the response.

The applicant credited the External Surfaces Monitoring Program with managing the loss of material on carbon steel components exposed to an inside environment. The staff reviewed the material, environment, and aging effects related to these components and the adequacy of this AMP for managing the identified aging effect. The staff finds this AMP adequate because it uses periodic inspections of the most susceptible components and locations to establish a baseline, trends the degradations, and takes corrective actions to prevent further degradations if such actions are warranted.

The applicant uses the One-Time Inspection Program to manage the material aging effect related to several different AERMs. The staff reviewed the utilization of the One-Time Inspection Program in these different combinations of materials, environments, and AERMs for the components in the reactor makeup water storage system and finds that this AMP, pending satisfactory resolutions of the RAIs, is adequate for managing the identified aging effect because these aging effects are expected to occur at a relatively slow rate.

The Periodic Surveillance and Preventive Maintenance Activities program is a condition monitoring program. It includes those preventive maintenance and surveillance testing activities credited with managing the aging effects identified in the AMRs. The staff reviewed the utilization of this program for the reactor makeup water storage tank diaphragm inspections for managing change in material properties, cracking, and the loss of material on the internal elastomer diaphragms in these tanks. The staff finds this AMP adequate because the applicant stated that the extent and schedule of inspections will assure detection of component degradation before the loss of intended functions occurs.

Sections 3.0.3.2.1, 3.0.3.3.2, 3.0.3.1, and 3.0.3.3.4 of this SER, respectively, detail the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds the applicant has identified appropriate AMPs for managing the aging effects of the reactor makeup water storage system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the reactor makeup water storage system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.2.3.24 Sampling System

Summary of Technical Information in the Application

In Section 3.3.2.1.24 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the sampling system:

- Water Chemistry Control Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.3.2-24 of the LRA, the applicant provided a summary of the AMRs for the sampling system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the sampling system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.3.2-24. Section 3.3.2.1 of this SER documents the staff's evaluation.

The staff reviewed the AMR of the sampling system relating to those combinations of components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.3.2-24. The staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.3.24 of the LRA lists individual system components within the scope of license renewal and subject to an AMR. The components that do not rely on the GALL Report for an AMR include sample cooler heat exchanger (tubes), piping, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Stainless steel components exposed to borated water, closed cooling water, or treated water environments are subject to the aging effects of loss of material and cracking.

- Stainless steel exposed to an inside environment experiences no aging effects.

The staff reviewed the information in Section 2.3.3.24, Table 2.3.3.24, Section 3.3.2.1.24, and Table 3.3.2-24 in the LRA. During its review, the staff determined that it needed additional information.

The staff organized its RAIs into general RAIs and system-specific RAIs. General RAIs applicable to this system include RAIs 3.3-10 and 3.3-15.

By letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in RAIs 3.3-10 and 3.3-15. By letter dated April 7, 2004, the applicant responded to these RAIs. Section 3.3.2.3.0 of this SER describe these RAIs, the applicant's responses, and the staff's evaluation of the responses.

By the same letter dated March 8, 2004, the staff requested the applicant to provide additional information on the issues described in system-specific RAI 3.3.2.1.24-1. By letter dated April 7, 2004, the applicant responded to this RAI. The following describes RAI 3.3.2.1.24-1, the responses to this RAI, and the staff's evaluation of the responses.

<u>Heat Exchanger Tube Function of the Sampling System (RAI 3.3.2.1.24-1)</u>. Table 2.3.3.24 of the LRA states that an intended function of the sampling system heat exchanger tubes is to exchange heat. The tubes may be subject to the buildup or deposit of fouling or other degradation that would result in a loss of this heat exchange function; however, the LRA does not identify this aging effect for the heat exchanger tubes in this system. The staff asked the applicant to provide the technical basis for excluding this aging effect on the heat exchangers.

By letter dated April 7, 2004, the applicant responded to RAI 3.3.2.1.24-1 by stating that SNC erred in applying the intended function of heat exchange to the sample cooler tubes. The sample coolers in the sampling system support the fire protection regulated event (10 CFR 50.48) and, therefore, are within the scope of license renewal according to 10 CFR 54.4(a)(3). The applicant credited manual sampling of certain parameters to verify achievement of an adequate cold shutdown margin in the fire protection safe-shutdown analysis. The tube side of these coolers is within the scope of license renewal for pressure boundary integrity to ensure that a flowpath to the sample sink is maintained. These coolers are not within scope for the intended function of heat exchange because the samples are taken when the fluid is relatively cool (approximately 200 °F). The applicant further stated that it should not have listed heat exchange in LRA Tables 2.3.3.24 and 3.3.2-24 as an intended function for the sampling system heat exchanger tubes. Since the only intended function of the sample cooler tubes is pressure boundary, fouling is not an AERM for license renewal.

The staff reviewed the applicant’s response to RAI 3.3.2.1.24-1 and found the response to be reasonable and acceptable because the applicant agreed that LRA Tables 2.3.3.24 and 3.3.2-24 should not have listed heat exchange as an intended function for the sampling system heat exchanger tubes, and that the only intended function of this component is pressure boundary.

On the basis of its review of the LRA and the additional information included in the applicant’s responses to the above RAIs, the staff finds the aging effects of the sampling system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the sampling system.

Aging Management Programs

After evaluating the applicant’s identification of aging effects for each of the above components, the staff reviewed the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.3.2-24 of the LRA identifies the following AMPs for managing the aging effects described above for the sampling system:

- Water Chemistry Control Program (Appendix B.3.2)

The applicant credited the Water Chemistry Control Program with managing the loss of material aging effect on the stainless steel piping, flow elements, orifices, and valve bodies exposed to treated water. During its review, the staff determined that it needed additional information, requested in RAI 3.3-10. Section 3.3.2.3.0 of this SER describe RAI 3.3-10, the applicant’s response to this RAI, and the staff’s evaluation of the response.

Section 3.0.3.2.1 of this SER provides the staff’s detailed review of this AMP.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the sampling system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the sampling system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.3.3 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that the effects of aging for auxiliary systems will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the auxiliary systems, as required by 10 CFR 54.21(d).

3.4 Aging Management of Steam and Power Conversion Systems

This section of the SER documents the staff's review of the applicant's AMR results for the steam and power conversion components and component groups associated with the following systems:

- main steam
- feedwater
- steam generator blowdown
- auxiliary feedwater
- auxiliary steam and condensate recovery

3.4.1 Summary of Technical Information in the Application

In Table 3.4.1, "Summary of the Aging Management Evaluations for Steam and Power Conversion Systems in Chapter VIII of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the steam and power conversion systems components and component groups that are relied on for license renewal.

The applicant's AMRs incorporated applicable plant-specific and industry operating experience to determine the AERMs. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report in 2001.

The applicant conducts its ongoing review of plant-specific and industry operating experience in accordance with the FNP, Units 1 and 2, Operating Experience Program.

3.4.2 Staff Evaluation

The staff reviewed LRA Section 3.4 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the steam and power conversion system components that are within the scope of license renewal and subject to an AMR 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 performed an audit and review to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report. However, the staff did determine that the applicant presented applicable material in the LRA and identified the appropriate GALL Report AMPs. Section 3.0.3 of this SER documents the staff's evaluations of these AMPs. The FNP Audit and Review Report, summarized in Section 3.4.2.1 of this SER, documents the details of the staff's evaluation of the audit and review for these AMRs.

The staff also performed an audit and review of those AMRs that were consistent with the GALL Report and for which further evaluation is recommended. During the audit and review, the staff determined that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.4.2.2 of the SRP-LR. The FNP Audit and Review Report, summarized in Section 3.4.2.2 of this SER, documents the details of the staff's evaluation of the audit and review for these AMRs.

The staff conducted a technical review of the remaining AMRs that were not consistent with the GALL Report. In the review, the staff evaluated whether the applicant identified all plausible aging effects and listed the appropriate aging effects for the material-environment combinations specified. Section 3.4.2.3 of this SER documents the details of the staff's review and evaluation for these AMRs that are not consistent with the GALL Report.

Finally, the staff reviewed the AMP summary descriptions in the FSAR Supplement to ensure that they adequately describe the programs credited with managing or monitoring aging for the reactor system components.

Table 3.4-1 below summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in Section 3.4 of the LRA that are addressed in the GALL Report.

Table 3.4-1 Staff Evaluation for Steam and Power Conversion System Components in the GALL Report

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Piping and fittings in main feedwater line, steamline, and AFW piping (PWR only) **Item Number 3.4.1-1**	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.4.2.2.1)
Piping and fittings, valve bodies and bonnets, pump casings, tanks, tubes, tubesheets, channel head and shell (except main steam system) **Item Number 3.4.1-2**	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Water chemistry and one-time inspection	Water Chemistry Control Program (Appendix B.3.2); One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.4.2.2.2)
AFW piping **Item Number 3.4.1-3**	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Plant specific	Service Water Program (Appendix B.4.4)	Consistent with GALL, which recommends further evaluation. (See Section 3.4.2.2.3)
Oil coolers in AFW system (lubricating oil side possibly contaminated with water) **Item Number 3.4.1-4**	Loss of material due to general (carbon steel only), pitting, and crevice corrosion and MIC	Plant specific	Water Chemistry Control Program (Appendix B.3.2); One-Time Inspection Program (Appendix B.5.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.4.2.2.5)
External surface of carbon steel components **Item Number 3.4.1-5**	Loss of material due to general corrosion	Plant specific	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends further evaluation. (See Section 3.4.2.2.4)
Carbon steel piping and valve bodies **Item Number 3.4.1-6**	Wall thinning due to FAC	FAC	Flow-Accelerated Corrosion Program (Appendix B.4.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1)
Carbon steel piping and valve bodies in main steam system **Item Number 3.4.1-7**	Loss of material due to pitting and crevice corrosion	Water chemistry	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Closure bolting in high-pressure or high-temperature systems **Item Number 3.4.1-8**	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1)
Heat exchangers and coolers/condensers serviced by OCCW **Item Number 3.4.1-9**	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	OCCW system	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1)
Heat exchangers and coolers/condensers serviced by CCCW **Item Number 3.4.1-10**	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	CCCW system	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1)
External surface of aboveground CST **Item Number 3.4.1-11**	Loss of material due to general (carbon steel only), pitting and crevice corrosion	Aboveground carbon steel tanks	External Surfaces Monitoring Program (Appendix B.5.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1)
External surface of buried CST and AFW piping **Item Number 3.4.1-12**	Loss of material due to general, pitting, and crevice corrosion and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1) Consistent with GALL, which recommends further evaluation. (See Section 3.4.2.2.5)
External surface of carbon steel components **Item Number 3.4.1-13**	Loss of material due to boric acid corrosion	Boric acid corrosion	Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.4.2.1)

The staff's review of the applicant's steam and power conversion system and associated components followed one of several approaches. One approach, documented in Section 3.4.2.1, involved the staff's review of the AMR results for components in the steam and power conversion system that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in Section 3.4.2.2, involved the staff's review of the AMR results for components in the steam and power conversion system that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in Section 3.4.2.3, involved the staff's review of the AMR results for components in the steam and power conversion system that the applicant indicated are not consistent with the GALL Report or are not addressed in the GALL Report. Section 3.0.3 of this SER documents the staff's review of AMPs that are credited to manage or monitor aging effects of the steam and power conversion system components.

3.4.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Not Recommended

<u>Summary of Technical Information in the Application</u>

In Sections 3.4.2.1.1 through 3.4.2.1.5 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the steam and power conversion system components:

- Water Chemistry Control Program
- One-Time Inspection Program
- Flow-Accelerated Corrosion Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program
- Service Water Program

<u>Staff Evaluation</u>

In Tables 3.4.2-1 through 3.4.2-5 of the LRA, the applicant summarized the AMRs for the steam and power conversion systems and identified which AMRs it considered to be consistent with the GALL Report.

The staff conducted an audit and review of the LRA and program basis documents, which are available at the applicant's engineering office. On the basis of its audit and review, the staff finds that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with GALL. Therefore, the staff finds that the applicant identified applicable aging effects that are appropriate for the material-environment combinations listed.

On the basis of its audit and review, 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).

<u>Conclusion</u>

The staff has determined the applicant's claim of consistency with the GALL Report. The staff reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.4.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Recommended

Summary of Technical Information in the Application

In Section 3.4.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for steam and power conversion systems. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, and crevice corrosion, microbiologically influenced corrosion, and biofouling
- general corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion

Staff Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's analysis to determine whether it adequately addressed these issues. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in Section 3.4.2.2 of the SRP-LR. The FNP Audit and Review Report documents the details of the staff's audit and review.

The GALL Report indicates that further evaluation should be performed for the aging effects described in the following sections.

3.4.2.2.1 Cumulative Fatigue Damage

As stated in the SRP-LR, fatigue is a TLAA, as defined in 10 CFR 54.3, and TLAAs must be evaluated in accordance with 10 CFR 54.21(c)(1). Section 4.3 of this SER documents the staff's review of the applicant's evaluation of this TLAA. In performing this review, the staff followed the guidance in Section 4.3 of the SRP-LR.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

In Section 3.4.2.2.2 of the LRA, the applicant addressed programs to verify the effectiveness of the Water Chemistry Control Program in managing the loss of material due to general, pitting, and crevice corrosion.

Section 3.4.2.2.2 of the SRP-LR recommends further evaluation of programs to manage the loss of material due to general, pitting, and crevice corrosion of carbon steel piping and fittings, valve bodies and bonnets, pump casings, pump suction and discharge lines, tanks, tubesheets, channel heads, and shells (except for main steam system components), and the loss of material due to crevice and pitting corrosion for stainless steel tanks and heat exchanger/cooler tubes. The GALL Report water chemistry program relies on monitoring and control of water chemistry, based on the guidelines in EPRI TR-102134, "PWR Secondary Water Chemistry Guideline," Revision 3, issued May 1993, for secondary water chemistry in PWRs, to manage the effects of the loss of material due to general (carbon steel only), pitting, or crevice corrosion. However, corrosion may occur at locations of stagnant flow conditions. Therefore, the GALL Report recommends that the effectiveness of the water chemistry control program should be verified to ensure that corrosion is not occurring.

In addition to the components identified in the GALL Report, the applicant credited the Water Chemistry Control Program (AMP B.3.2) for management of this aging effect and the One-Time Inspection Program (AMP B.5.5) to verify the effectiveness of the Water Chemistry Control Program. The staff reviewed the applicant's proposed programs and plant operating experience to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation. Sections 3.0.3.2.1 and 3.0.3.1, respectively, of this SER document the staff's evaluation of these programs. The staff concludes that these programs are appropriate for managing this aging effect.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving the management of the loss of material due to general, pitting, and crevice corrosion for components in the steam and power conversion systems, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 Loss of Material Due to General, Pitting, and Crevice Corrosion, Microbiologically Influenced Corrosion, and Biofouling

In Section 3.4.2.2.3 of the LRA, the applicant stated that the carbon steel AFW piping that is subject to general, pitting, and crevice corrosion, MIC, and biofouling is located in a crosstie to the OCCW system, which contains raw water. Two locked, closed valves separate this OCCW system crosstie piping from the AFW system. The applicant credited the Service Water Program (AMP B.4.4) to manage the loss of material in this crosstie piping.

Section 3.4.2.2.3 of the SRP-LR recommends further evaluation of programs to manage the loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling for carbon steel piping and fittings for untreated water from the backup water supply in the AFW system.

The staff determined that the FNP AFW system contains treated water, so that the components in this system are not subject to these same aging effects/mechanisms. In addition, for certain sections of the AFW system piping that are exposed to a raw water environment, the Service Water Program manages this aging effect. Based on its review, the staff concludes that the Service Water Program is consistent with GALL AMP XI.M20, "Open-Cycle Cooling Water System," with acceptable enhancements and can effectively manage the aging effects of loss of material. Specifically, the applicant will enhance the scope of the Service Water Program to include the inspection of piping from the main service water header to the air compressor and the service water pump columns. Section 3.0.3.2.5 of this SER documents the staff's evaluation.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving the management of the loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling for AFW system components since the FNP AFW system contains treated water and is not exposed to a raw water environment, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.4 General Corrosion

In Section 3.4.2.2.4 of the LRA, the applicant credited the External Surfaces Monitoring Program (AMP B.5.3) with managing the loss of material on carbon steel component exterior surfaces subject to corrosion.

Section 3.4.2.2.4 of the SRP-LR states that the loss of material due to general corrosion could occur on the external surfaces of all carbon steel structures and components, including closure bolting, exposed to operating temperature less than 212 °F. The GALL Report recommends further evaluation to ensure adequate management of this aging effect.

In RAI 2.3.4.4-1, the staff questioned why the applicant excluded the turbine lube oil subsystem and its components from the scope of license renewal. In its response dated April 7, 2004, the applicant stated that it added several components related to the turbine lube oil subsystem to the scope of the AFW system. The staff reviewed the components added to FNP LRA Table 3.4.2-4 as subject to an AMR and concludes that the addition of these components does not result in the addition of material-environment combinations or AMPs for the AFW system.

The staff reviewed the applicant's proposed program to ensure that it will have an adequate program in place for the management of this aging effect. Based on the staff's review of the External Surfaces Monitoring Program, the staff concludes that the program will adequately manage these aging effects. Section 3.0.3.3.2 documents the evaluation of this program.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving the management of the loss of material due to general corrosion for components in the steam and power conversion systems, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

In Section 3.4.2.2.5 of the LRA, the applicant stated that loss of material due to general corrosion (carbon steel only), pitting and crevice corrosion, and MIC could occur in stainless steel and carbon steel components exposed to lubricating oil in the auxiliary system.

Section 3.4.2.2.5 of the SRP-LR addresses the loss of material due to general corrosion (carbon steel only), pitting and crevice corrosion, and MIC which could occur in stainless steel and carbon steel shells, tubes, and tubesheets within the bearing oil coolers (for steam turbine pumps) in the PWR AFW system. The GALL Report recommends further evaluation to ensure the adequate management of these aging effects.

Section 3.4.2.2.5 of the SRP-LR also addresses the loss of material due to general, pitting, and crevice corrosion, and MIC, which could occur in underground piping and fittings and the emergency CST in the AFW system and the underground CST in the condensate system. The Buried Piping and Tank Inspection Program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of the loss of material from general, pitting, and crevice corrosion, and MIC. The SRP-LR recommends verification of the effectiveness of the buried piping and tank inspection program to evaluate an applicant's inspection frequency and operating experience with buried components, ensuring that loss of material is not occurring.

In the LRA, the applicant determined that the loss of material is not an AERM for the AFW system turbine lube oil cooling system. The applicant stated that water intrusion is not a credible occurrence since the system is closed. A review of the operating experience does not indicate any significant water intrusion. Treated water supplied from the CST cools the lube oil. The applicant credited the Water Chemistry Control Program (AMP B.3.2) and the One-Time Inspection Program (AMP B.5.5) with managing aging of the lube oil heat exchanger components, such that the integrity of the lube oil system will be maintained.

The staff reviewed the applicant's proposed program to ensure that it will have an adequate program in place for the management of this aging effect. Based on the staff's review of the Water Chemistry Control Program and the One-Time Inspection Program, the staff concludes that the programs will adequately manage these aging effects. Sections 3.0.3.2.1 and 3.0.3.1, respectively, of this SER document the evaluation of the programs.

In the LRA, the applicant stated that the CST and AFW system piping are not buried. Therefore, the applicant determined that these components are not subject to the aging effect of loss of material in underground piping, fittings, and storage tanks.

The staff confirmed that the CST and AFW system piping are not buried at FNP and concurs with the applicant that these components are not subject to the aging effect.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving the management of the loss of material due to general, pitting, and crevice corrosion, and MIC for components in the steam and power conversion systems, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Conclusion

On the basis of its audit and review, the staff finds that the applicant's further evaluations, conducted in accordance with the GALL Report, are consistent with the acceptance criteria in Section 3.4.2.2 of the SRP-LR. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

3.4.2.3.1 Main Steam System AMR Results

Summary of Technical Information in the Application

In Section 3.4.2.1.1 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the main steam system:

- Water Chemistry Control Program
- One-Time Inspection Program
- Flow-Accelerated Corrosion Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.4.2-1 of the LRA, the applicant summarized the AMRs for the main steam system components and identified which AMRs it did not consider to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the main steam system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.4.2-1. Section 3.4.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMRs of the combinations of main steam system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.4.2-1. For the combinations using notes F through J, the staff determined that the applicant has identified all applicable AERMs and has credited the appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

Table 2.3.4-1 of the LRA lists individual system components for the main steam system within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for AMR include flow orifice/element, piping, steam traps, turbine drive pump casings, and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Stainless steel components exposed to steam and treated water environments are subject to the aging effects of cracking and loss of material.

- Carbon steel components exposed to an air/gas environment are subject to the aging effect of loss of material.

- Alloy steel components exposed to steam and treated water environments are subject to the aging effect of loss of material.

- Stainless steel components exposed to inside and outside environments experience no aging effects.

- Alloy steel components exposed to an outside environment experience no aging effects.

During its review, the staff determined that it needed additional information to complete its evaluation of the main steam system. Section 3.4.2.3.6.1 of the SER provides the staff's evaluation of the loss of material for stainless steel components in a treated water environment and cracking for stainless steel components in a treated water and steam environment. Section 3.2.2.3.4.2 of the SER provides the staff's evaluation of the loss of preload and cracking for closure bolting.

Table 3.4.2-1 of the LRA identifies the loss of material as an aging effect for alloy steel steam/fluid traps in a steam and treated water environment. The applicant credited the Water Chemistry Control Program to manage this aging effect. However, the applicant did not credit a one-time inspection to verify the effectiveness of the Water Chemistry Control Program. In RAI 3.4-3 dated March 17, 2004, the staff asked the applicant to justify not performing a one-time inspection to verify the effectiveness of the Water Chemistry Control Program for the steam/fluid traps. In its response dated March 5, 2004, the applicant stated that a one-time inspection is not necessary for the main steam components because the very low oxygen concentration and the ultra-high purity of the steam exiting the SGs precludes significant corrosion of the carbon steel and alloy steel components in this system. While the steam traps will be exposed to treated water as well as steam, the condensed steam does not contain sufficient oxygen or contaminates to promote significant corrosion of alloy steel components. However, the staff does not concur with the applicant's assessment that corrosion is not an AERM for the alloys steel traps in condensate. Although NUREG-1801 does not recommend a one-time inspection to verify the effectiveness of the Water Chemistry Control Program for main steam components in a steam environment, the traps are located in a moist steam and treated water environment where general corrosion is a likely aging effect. Therefore, a one-time inspection is recommended to verify the effectiveness of the Water Chemistry Control Program in this environment. In its supplemental response to RAI 3.4-3 dated May 28, 2004, the applicant stated that it will include alloy steel steam and fluid traps in steam and treated water environments within the scope of the One-Time Inspection Program. The staff considers the applicant's use of the one-time inspection acceptable since it verifies the effectiveness of the Water Chemistry Control Program to manage the loss of material for the steam and fluid traps in condensed steam and treated water environments.

Table 3.4.2-1 of the LRA identifies no aging effects for alloy steel steam/fluid traps in an outside environment. The LRA defines an outside environment as a environment where components are exposed to direct sunlight, precipitation, and freezing conditions. The GALL Report recommends aging management for the loss of material due to general corrosion on the external surfaces of carbon (alloy) steel components exposed to operating temperatures less than 212 °F; such corrosion may be due to air, moisture, or humidity. In RAI 3.0-1(B) dated March 17, 2004, the staff asked the applicant to provide a program to manage corrosion on the external surface of alloy steel steam/fluid traps in an outside environment or to justify not managing this aging effect. In its response dated April 16, 2004, the applicant stated that the steam/fluid traps are exposed to operating temperatures greater than 212 °F. These steam/fluid traps are located in a vented portion of the main steam valve room (MSVR), which is covered with a roof, but the walls are made from grating. Components in the MSVR are exposed to outside air but are sheltered from rain. The applicant also identified that borated water leakage is not a concern in this area. Based on the applicant's response that the steam/fluid traps operate at a temperature above 212 °F and are sheltered from rain, the staff considers the loss of material on the external surface of these components not to be an AERM.

On the basis of its review of the LRA, the staff finds that the aging effects of the main steam system component types given above that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.4.2-1 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the main steam system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.4.2-1 of the LRA identifies the following AMPs for managing the aging effects described above for the main steam system:

- Water Chemistry Control Program (LRA Section B.3.2)
- One-Time Inspection Program (LRA Section B.5.5)

Sections 3.0.3.2.1 and 3.0.3.1 of this SER, respectively, provide the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified the appropriate AMPs for managing the aging effects of the main steam system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the main steam system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that the FSAR Supplement adequately describes the AMPs credited with managing aging in these components, as required by 10 CFR 54.21(d).

3.4.2.3.2 Feedwater System AMR Results

Summary of Technical Information in the Application

In Section 3.4.2.1.2 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs to manage the aging effects related to the feedwater system:

- Water Chemistry Control Program
- One-Time Inspection Program
- Flow-Accelerated Corrosion Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.4.2-2 of the LRA, the applicant provided a summary of AMRs for the feedwater system components and identified which AMRs it considered not to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the feedwater system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.4.2-2. Section 3.4.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMR of the combinations of feedwater system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.4.2-2. For the combinations using notes F through J, the staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

During the scoping review, in its response to RAI 2.1-1 dated June 4, 2004, the applicant added pump casing to Tables 2.3.4.2 and 3.4.2-2. The applicant stated that the aging effect for the stainless steel pump casings in a treated water environment is loss of material. The One-Time Inspection Program and the Water Chemistry Control Program will manage this aging effect. The applicant did not identify any aging effects for the stainless steel pump casings in an inside environment.

Aging Effects

Table 2.3.4-2 of the LRA lists individual system components for the feedwater system within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include piping and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Stainless steel components exposed to treated water environment are subject to the aging effects of cracking and loss of material.

- Stainless steel components exposed to an outside environment experience no aging effects.

- Stainless steel components exposed to an inside environment experience no aging effects.

During its review, the staff determined that it needed additional information to complete its evaluation of the feedwater system. Section 3.4.2.3.6.1 outlines the staff's evaluation of the loss of material for stainless steel components in a treated water environment and cracking for stainless steel components in a treated water and steam environment. Section 3.2.2.3.4.2 provides the staff's evaluation of the loss of preload and cracking for closure bolting.

On the basis of its review of the LRA, the staff finds that the aging effects given for the feedwater system component types listed above are appropriate for the industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.4.2-2 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the feedwater system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.4.2-2 of the LRA identifies the following AMP for managing the aging effects described above for the feedwater system:

- Water Chemistry Control Program (LRA Section B.3.2)

Section 3.0.3.2.1 of this SER provides the staff's review of this AMP.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the feedwater system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the feedwater system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.4.2.3.3 Steam Generator Blowdown System AMR Review

Summary of Technical Information in the Application

In Section 3.4.2.1.3 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the SG blowdown system:

- Water Chemistry Control Program
- One-Time Inspection Program
- Flow-Accelerated Corrosion Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.4.2-3 of the LRA, the applicant provided a summary of AMRs for the SG blowdown system components and identified which AMRs it considered not to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the containment spray system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.4.2-3. Section 3.4.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMR of the combinations of SG blowdown system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.4.2-3. For the combinations using notes F through J, the staff concluded that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

Table 2.3.4-3 of the LRA lists individual system components for the SG blowdown system within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR include valve bodies.

For this component type, the applicant identified the following materials, environments, and AERMs:

- Stainless steel components exposed to a treated water environment are subject to the aging effects of cracking and loss of material.

- Stainless steel components exposed to an inside environment experience no aging effects.

During its review, the staff determined that it needed additional information to complete its evaluation of the SG blowdown system. Section 3.4.2.3.6.1 of the SER provides the staff's evaluation of the loss of material for stainless steel components in a treated water environment and cracking for stainless steel components in a treated water and steam environment. Section 3.2.2.3.4.2 of the SER outlines the staff's evaluation of the loss of preload and cracking for closure bolting.

On the basis of its review of the LRA, the staff finds the aging effects of the above SG blowdown system component types that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.4.2-3 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the SG blowdown system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.4.2-3 of the LRA identifies the following AMP for managing the aging effects described above for the SG blowdown system:

C Water Chemistry Control Program (LRA Section B.3.2)

Section 3.0.3.2.1 of this SER provides the staff's review of the AMP.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the SG blowdown system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

<u>Conclusion</u>

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the SG blowdown system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by

10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.4.2.3.4 Auxiliary Feedwater System AMR Review

Summary of Technical Information in the Application

In Section 3.4.2.1.4 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the AFW system:

- Water Chemistry Control Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Service Water Program

In Table 3.4.2-4 of the LRA, the applicant summarized the AMRs for the AFW system components and identified which AMRs it did not consider to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the Auxiliary Feedwater system components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.4.2-4. Section 3.4.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMR of the combinations of AFW system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.4.2-4. For the combinations using notes F through J, the staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

During the scoping review, in response to RAI 2.3.4.4-1 dated April 7, 2004, the applicant identified the turbine AFW pump turbine lube oil subsystem component types subject to aging management as closure bolting, filters, flow orifice/element, oil cooler (shell, channel head, tubesheet, and tubes), piping, pump casings, sight glasses, tanks (auxiliary oil reservoir), and valve bodies. Of these components, the LRA did not identify the flow orifice/element, sight glasses, and tanks (auxiliary oil reservoir); however, the applicant has added them to Tables 2.3.4.4 and 3.4.2-4. The applicant stated that no aging effects require aging management for the stainless steel flow orifice/element, the glass sight glasses, and the carbon tanks (auxiliary oil reservoir) in a lube oil environment, or for the stainless steel flow orifice/element and the glass sight glasses in an inside environment.

During the scoping review, in its response to RAI 2.3.3.7-4 dated April 22, 2004, the applicant added CST diaphragms to Tables 2.3.4.4 and 3.4.2-4. The applicant stated that the Periodic Surveillance and Preventive Maintenance Activity will manage the aging effects for the elastomer diaphragm resulting from a change in material properties, cracking, and loss of material in treated water and air/gas environments.

During the scoping review, in response to NRC Inspection Report Nos. 50-348/2004-007 and 50-364/2007-007, dated June 22, 2004, the applicant added the vents for the condensate storage tank in the scope of license renewal. The vents are considered an integral subpart of the tank and, consequently, are part of the condensate storage tank listed in LRA Table 3.4.2-4. The applicant stated that the aging effect for the carbon vents in an air/gas (non-wetted) environment is loss of material. The applicant stated that this aging effect will be managed by the One-Time Inspection Program.

Aging Effects

Table 2.3.4-4 of the LRA lists individual system components for the AFW system within the scope of license renewal and subject to AMR. The component types that do not rely on the GALL Report for AMR include filters; flow orifice/elements; oil cooler shell, channel head, tubesheet, and tubes; piping; pump casings; and valve bodies.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Stainless steel components exposed to a treated water environment are subject to the aging effects of loss of material and fouling.

- Stainless steel oil cooler tubes exposed to a lube oil environment are subject to the aging effect of fouling.

- Stainless steel components exposed to inside and outside environments experience no aging effects.

- Carbon steel, stainless steel, and glass components exposed to a lube environment experience no aging effects.

- Elastomers exposed to treated water and air/gas environments experience a change in material properties, cracking, and loss of material.

- Glass components exposed to an inside environment experience no aging effects.

During its review, the staff determined that it needed additional information to complete its evaluation of the AFW system. Section 3.4.2.3.6.1 of the SER outlines the staff’s evaluation of the loss of material for stainless steel components in a treated water environment. Section 3.2.2.3.4.2 of the SER provides the staff’s evaluation of the loss of preload and cracking for closure bolting.

Table 3.4.1-4 of the LRA states that the applicant determined loss of material not to be an AERM for the AFW system turbine oil cooling system. Table 3.4.2-4 identifies no AERMs for carbon and stainless AFW components in an oil environment. For AFW oil cooler tubes, Table

3.4.2-4 only identifies fouling as an AERM. The GALL Report recommends a plant-specific AMP for the loss of material due to general (carbon steel only), pitting, and crevice corrosion and MIC in carbon and stainless steel components exposed to lubricating oil that may be contaminated with water. In RAI 3.4-5, the staff asked the applicant to justify not managing the aging effect of loss of material due to general, pitting, and crevice corrosion and MIC for the AFW system turbine oil cooling system components. In its response dated April 7, 2004, the applicant stated that the lubricating oil systems are typically closed systems, and tube failure is not assumed because the cooling water side of the tubes is managed for aging. Therefore, the lubricating oil is assumed to be free of water contamination. Significant corrosion is only expected where water can settle or pool. Since water contamination is not expected, settling or pooling should not occur; therefore, the lubricating oil systems are not susceptible to the loss of material due to general, pitting, and crevice corrosion or MIC. The applicant stated that its operating experience supports this conclusion. Although not credited for aging management, operators visually check the oil levels for the high safety injection/charging pumps during every shift for the proper level and for visual evidence of contamination. The oil is sampled every 3 months and is changed based on the results of the sample analysis. The applicant also checks oil levels and conditions during quarterly pump surveillance testing. Based on the applicant's response that it does not expect water settling or pooling and because operating experience at FNP supports this conclusion, the staff concurs that the loss of material in the lubricating oil coolers is not an AERM.

Table 3.4.2-4 of the LRA identifies fouling as an aging effect for the AFW oil cooler tubes in both an oil and treated water environment and the oil cooler tubesheet in a treated water environment. The applicant credited the One-Time Inspection Program to manage this aging effect. In RAI 3.4-6, the staff requested the applicant to explain why Section B.5.5.5, "Specific Components in the Sample Population," of the One-Time Inspection Program does not contain inspection criteria for the AFW tubes or tubesheet. In its response dated March 5, 2004, the applicant stated that the oil cooler in Table 3.4.2-4 is the turbine-driven auxiliary feedwater pump (TDAFWP) turbine lube oil cooler, and the LRA identifies fouling as the aging effect for the stainless steel cooler tubes, tubesheet, and channel head in a treated water environment. Further evaluation indicated that fouling is not a plausible aging mechanism for stainless steel in a treated water environment. The AFW oil cooler draws its cooling water from the AFW supply to the pump, which is the same treated water that is stored in the CST. The rigorous chemistry controls maintained on this system eliminate fouling as a plausible aging effect. Therefore, the applicant stated that it will remove fouling as an AERM for stainless steel AFW cooler components in the treated water environment. Fouling of the oil cooler tubes in a lube oil environment remains as an aging effect managed by the One-Time Inspection Program. To address the staff's concern that Section B.5.5.5 of the One-Time Inspection Program does not include the lube oil cooler tubes, SNC will include a one-time inspection of the TDAFWP turbine lube oil coolers within the listing of one-time inspections on the FNP License Renewal Future Actions Commitment List. Based on the applicant's response, the staff concurs that fouling for the stainless steel AFW cooler components in a treated water environment is not an aging effect that requires management, and SNC's inclusion of the one-time inspection of the TDAFWP turbine lube oil coolers on the FNP License Renewal Future Actions Commitment List is an acceptable action to document this inspection.

By RAI 3.4-7, the staff requested the applicant to explain how degradation will be managed on the bottom exterior surface of the buried condensate storage tank (CST). In its response dated March 5, 2004, the applicant stated that the One-Time Inspection Program will be revised to include a thickness measurement of the bottom of the Unit 1 CST prior to the period of extended operation.

On the basis of its review of the LRA, the staff finds that the aging effects of the above AFW system component types that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.4.2-4 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the AFW system.

Aging Management Programs

After evaluating the aging effects identified by the applicant for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.4.2-4 of the LRA identifies the following AMPs for managing the aging effects described above for the AFW system:

- Water Chemistry Control Program (LRA Section B.3.2)
- One-Time Inspection Program (LRA Section B.5.5)
- Periodic Surveillance and Preventive Maintenance Activities (LRA Section B.5.9)

Sections 3.0.3.2.1, 3.0.3.1, and 3.0.3.3.4 of this SER, respectively, provide the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the AFW system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the AFW system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program descriptions and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.4.2.3.5 Auxiliary Steam and Condensate Recovery System AMR Review

Summary of Technical Information in the Application

In Section 3.4.2.1.5 of the LRA, the applicant identified the materials, environments, and

AERMs. The applicant identified the following programs that manage the aging effects related to the auxiliary steam and condensate recovery system:

- Water Chemistry Control Program
- Flow-Accelerated Corrosion Program
- One-Time Inspection Program
- External Surfaces Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.4.2-5 of the LRA, the applicant provided a summary of AMRs for the auxiliary steam and condensate recovery system components and identified which AMRs it considered not to be consistent with the GALL Report.

Staff Evaluation

The staff reviewed the AMRs of the Auxiliary Steam and Condensate Recovery System components relating to those combinations of components, materials, environments, and AERMs and found them to be consistent with the GALL Report. These combinations use notes A through E in LRA Table 3.4.2-5. Section 3.4.2.1 of this SER documents the staff's evaluation.

The technical staff reviewed the AMR of the combinations of auxiliary steam and condensate recovery system components, materials, environments, and AERMs that are not addressed in the GALL Report. These combinations use notes F through J in LRA Table 3.4.2-5. For the combinations using notes F through J, the staff determined that the applicant has identified all applicable AERMs and has credited appropriate AMPs for managing these effects. The staff also reviewed the applicable FSAR Supplements for the AMPs to ensure that they adequately describe the AMPs.

Aging Effects

Table 2.3.4-5 of the LRA lists individual system components for the auxiliary steam and condensate recovery system within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for AMR include piping, pump casings, and tanks.

For these component types, the applicant identified the following materials, environments, and AERMs:

- Stainless steel components exposed to steam and treated water environments are subject to the aging effects of cracking and loss of material.

- Cast iron and carbon steel components exposed to a treated water environment are subject to the aging effect of loss of material.

- Cast iron components exposed to an inside environment are subject to the aging effect of loss of material.

- Stainless steel components exposed to an inside environment experience no aging effects.

During its review, the staff determined that it needed additional information to complete its evaluation of the auxiliary steam and condensate recovery system. Section 3.4.2.3.6.1 outlines the staff's evaluation of the loss of material for stainless steel components in a treated water environment and cracking for stainless steel components in a treated water and steam environment. Section 3.2.2.3.4.2 provides the staff's evaluation of loss of preload and cracking for closure bolting.

In RAI 3.4-7, the staff requested the applicant to explain how it will manage loss of material on the exterior bottom surface of the CST which is not accessible for visual inspection. In its response dated March 5, 2004, the applicant stated that it will revise the One-Time Inspection Program to include a thickness measurement of the bottom of the Unit 1 CST before the period of extended operation. The exterior bottom surfaces of the auxiliary steam condensate tanks and condensate return unit tanks are accessible for visual inspection. Based on the applicant's response, the staff finds the one-time inspection of the CST bottom acceptable to manage this aging effect.

On the basis of its review of the LRA, the staff finds the aging effects of the above auxiliary steam and condensate recovery system component types that are not addressed by the GALL Report are consistent with industry experience for these material-environment combinations. The staff did not identify any omitted aging effects for the combinations in LRA Table 3.4.2-5 using notes F through J. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the above components in the auxiliary steam and condensate recovery system.

Aging Management Programs

After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also determined that the FSAR Supplement adequately describes the program.

Table 3.4.2-5 of the LRA identifies the following AMPs for managing the aging effects described above for the auxiliary steam and condensate recovery system:

- Water Chemistry Control Program (LRA Section B.3.2)
- Borated Water Leakage Assessment and Evaluation Program (LRA Section B.3.5)

Sections 3.0.3.2.1 and 3.0.3.1 of this SER, respectively, provide the staff's review of these AMPs.

On the basis of its review of the LRA, the staff finds that the applicant has identified appropriate AMPs for managing the aging effects of the auxiliary steam and condensate recovery system component types that are not addressed by the GALL Report. In addition, the staff finds the program descriptions in the FSAR Supplement acceptable.

Conclusion

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the auxiliary steam and condensate recovery system components that are not addressed by the GALL Report, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 51.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.4.2.3.6 Generic Issues for the Steam and Power Conversion Systems

<u>3.4.2.3.6.1</u> Table 3.4.2 of the LRA identifies loss of material as the aging effect for stainless steel components in treated water environments and cracking as the aging effect for stainless steel components in steam or treated water environments. The applicant credited the Water Chemistry Control Program with managing these aging effects. In RAI 3.4-1, the staff requested that the applicant explain why it will not perform a one-time inspection to verify the effectiveness of the Water Chemistry Control Program for these aging effects. In its response dated April 7, 2004, the applicant stated that the Water Chemistry Control Program provides for the control of chemistry parameters associated with the corrosion of stainless steel components in the steam and power conversion systems. Chlorides, sulfides, and dissolved oxygen concentrations are maintained in the low range of parts per billion, and, under these conditions, the corrosion of austenitic stainless steels is unlikely. The FNP operating experience review performed for development of the FNP license renewal application did not identify any failures of stainless steel components in the steam and power conversion system caused by cracking or loss of material. This site-specific operating experience confirms that the Water Chemistry Control Program is adequate to manage this aging effect without a one-time inspection. Based on the applicant’s response that the Water Chemistry Program effectively manages the loss of material and cracking for stainless steel piping in the steam and power conversion systems, and because operating experience at FNP supports this conclusion, the staff concurs that an inspection program is not required.

3.4.3 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that the aging effects associated with the steam and power conversion system components will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in steam and power conversion system components, as required by 10 CFR 54.21(d).

<u>3.5 Aging Management of Containments, Structures, and Component Supports</u>

This section of the SER documents the staff’s review of the applicant’s AMR results for the containments, structures, and component supports, as well as component groups associated with the following systems:

- pressurized-water reactor concrete containment

- auxiliary building
- diesel generator building
- turbine building
- utility/piping tunnels
- water control structures
- steel tank structures
- yard structures
- component supports

3.5.1 Summary of Technical Information in the Application

In Table 3.5.1 of the LRA, “Summary of Aging Management Evaluations for Structures and Component Supports in Chapters II and III of NUREG-1801,” the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the containments, structures, and component supports component groups that it relies on for license renewal.

The applicant’s AMRs incorporated applicable operating experience in determining AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant’s review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report in 2001.

The applicant’s ongoing review of plant-specific and industry operating experience is conducted in accordance with the FNP, Units 1 and 2, Operating Experience Program.

3.5.2 Staff Evaluation

The staff reviewed LRA Section 3.5 to determine if the applicant provided sufficient information to demonstrate that the effects of aging on the containments, structures, and component supports that are within the scope of license renewal and subject to an AMR 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 performed an audit and review to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report. However, the staff did determine that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMPs. The staff documents its evaluations of the AMPs in Section 3.0.3 of this SER. The FNP Audit and Review Report, summarized in Section 3.5.2.1 of this SER, documents details of the staff’s evaluation of the FNP audit and review for these AMRs.

The staff also performed an audit and review of those AMRs that were consistent with the GALL Report and for which further evaluation is recommended. During the audit and review, the staff determined that the applicant’s further evaluations were consistent with the acceptance criteria in Section 3.5.2.2 of the SRP-LR. The FNP Audit and Review Report, summarized in Section 3.5.2.2 of this SER, details the staff’s evaluation of the FNP audit and review for these AMRs.

The staff conducted a technical review of the remaining AMRs that were not consistent with the

GALL Report. The review included evaluating whether the applicant had identified all plausible aging effects that were appropriate for the material-environment combinations specified. Section 3.5.2.3 of this SER documents the details of the staff's review and evaluation for these AMRs that are not consistent with the GALL Report.

Finally, the staff reviewed the AMP summaries in the FSAR Supplement to ensure that the applicant adequately described the programs credited with managing or monitoring aging for the reactor system components.

Table 3.5-1 below summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in Section 3.5 of the LRA that are addressed in the GALL Report.

Table 3.5-1 Staff Evaluation for Containments, Structures, and Component Supports System Components in the GALL Report

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Common Components of All Types of PWR and BWR Containment				
Penetration sleeves, bellows, and dissimilar metal welds **Item Number 3.5.1-1**	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.6)
Penetration sleeves, bellows, and dissimilar metal welds **Item Number 3.5.1-2**	Cracking due to cyclic loading, or crack initiation and growth due to SCC	Containment ISI and containment leak rate test	None	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.7)
Penetration sleeves, bellows, and dissimilar metal welds **Item Number 3.5.1-3**	Loss of material due to corrosion	Containment ISI and containment leak rate test	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Personnel airlock and equipment hatch **Item Number 3.5.1-4**	Loss of material due to corrosion	Containment ISI and containment leak rate test	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Personnel airlock and equipment hatch **Item Number 3.5.1-5**	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms	Containment leak rate test and plant TSs	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Seals, gaskets, and moisture barriers **Item Number 3.5.1-6**	Loss of sealant and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers	Containment ISI and containment leak rate test	Inservice Inspection Program (Appendix B.3.1); Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
PWR Concrete (Reinforced and Prestressed) and Steel Containment BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment				
Concrete elements: foundation, dome, and wall **Item Number 3.5.1-7**	Aging of accessible and inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment ISI	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.1)
Concrete elements: foundation **Item Number 3.5.1-8**	Cracks, distortion, and increases in component stress level due to settlement	Structures monitoring	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.2.2)
Concrete elements: foundation **Item Number 3.5.1-9**	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures monitoring	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.2.2)
Concrete elements: foundation, dome, and wall **Item Number 3.5.1-10**	Reduction of strength and modulus due to elevated temperature	Plant specific	Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.3)
Prestressed containment: tendons and anchorage components **Item Number 3.5.1-11**	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.5)
Steel elements: liner plate, containment shell **Item Number 3.5.1-12**	Loss of material due to corrosion in accessible and inaccessible areas	Containment ISI and containment leak rate test	Inservice Inspection Program (Appendix B.3.1); Borated Water Leakage Assessment and Evaluation Program (Appendix B.3.5)	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.4)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel elements: protected by coating **Item Number 3.5.1-14**	Loss of material due to corrosion in accessible areas only	Protective coating monitoring and maintenance	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Prestressed containment: tendons and anchorage components **Item Number 3.5.1-15**	Loss of material due to corrosion of prestressing tendons and anchorage components	Containment ISI	Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Concrete elements: foundation, dome, and wall **Item Number 3.5.1-16**	Scaling, cracking, and spalling due to freeze-thaw; expansion and cracking due to reaction with aggregate	Containment ISI	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Class I Structures				
All groups except Group 6: accessible interior/exterior concrete and steel components **Item Number 3.5.1-20**	All types of aging effects	Structures monitoring	Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.2)
Groups 1-3, 5, and 7-9: inaccessible concrete components, such as exterior walls belowgrade and foundation **Item Number 3.5.1-21**	Aging of inaccessible concrete areas due to aggressive chemical attack and corrosion of embedded steel	Plant specific	Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2)
Group 6: all accessible/ inaccessible concrete, steel, and earthen components **Item Number 3.5.1-22**	All types of aging effects, including loss of material due to abrasion, cavitation, and corrosion	Inspection of water-control structures or FERC/US Army Corps of Engineers dam inspection and maintenance	Service Water Pond Dam Inspection Program (Appendix B.3.3); Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.2)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 5: liners **Item Number 3.5.1-23**	Crack initiation and growth due to SCC; loss of material due to crevice corrosion	Water chemistry and monitoring of spent fuel pool water level	Water Chemistry Control Program (Appendix B.3.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Groups 1-3, 5, and 6: all masonry block walls **Item Number 3.5.1-24**	Cracking due to restraint, shrinkage, creep, and aggressive environment	Masonry wall	Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Groups 1-3, 5,and 7-9: foundation **Item Number 3.5.1-25**	Cracks, distortion, and increases in component stress level due to settlement	Structures monitoring	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.2.2)
Groups 1-3 and 5-9: foundation **Item Number 3.5.1-26**	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures monitoring	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.2.2)
Groups 1-5: concrete **Item Number 3.5.1-27**	Reduction of strength and modulus due to elevated temperature	Plant specific	None	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.3)
Component Supports				
Groups 7 and 8: liners **Item Number 3.5.1-28**	Crack initiation and growth due to SCC; loss of material due to crevice corrosion	Plant specific	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
All groups' support members: anchor bolts, concrete surrounding anchor bolts, welds, grout pads, bolted connections, etc. **Item Number 3.5.1-29**	Aging component supports	Structures monitoring	Structural Monitoring Program (Appendix B.4.3)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Groups B.1, B1.2, and B1.3 support members: anchor bolts and welds **Item Number 3.5.1-30**	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	10 CFR 54.21(c)(1)(i) analyses remain valid	Consistent with GALL, which recommends further evaluation. (See Section 3.5.2.2.11)
All groups' support members: anchor bolts and welds **Item Number 3.5.1-31**	Loss of material due to boric acid corrosion	Boric acid corrosion	Borated Water Leakage Assessment and Evaluation Program (Appendix B 3.5)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Groups B1.1, B1.2, and B1.3 support members: anchor bolts, welds, spring hangers, guides, stops, and vibration isolators **Item Number 3.5.1-32**	Loss of material due to environmental corrosion; loss of mechanical function due to corrosion, distortion, dirt, overload, etc.	ISI	Structural Monitoring Program (Appendix B.4.3); Inservice Inspection Program (Appendix B.3.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)
Group B1.1: high-strength, low-alloy bolts **Item Number 3.5.1-33**	Crack initiation and growth due to SCC	Bolting integrity	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.5.2.1)

The staff's review of the applicant's containments, structures, and components supports and associated components followed one of several approaches. One approach, documented in Section 3.5.2.1 of this SER, involved the staff's review of the AMR results for components in the containments, structures, and components supports and associated components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in Section 3.5.2.2 of this SER, involved the staff's review of the AMR results for components in the containments, structures, and components supports and associated components that the applicant indicated are consistent with the GALL Report, and for which further evaluation is recommended. A third approach, documented in Section 3.5.2.3 of this SER, involved the staff's review of the AMR results for components in the containments, structures, and components supports and associated components that the applicant indicated are not consistent with the GALL Report or are not addressed in the GALL Report. The staff documents its review of AMPs that are credited to manage or monitor aging effects of the containments, structures, and components supports in Section 3.0.3 of this SER.

3.5.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Not Recommended

<u>Summary of Technical Information</u>

In Sections 3.5.2.1.1 through 3.5.2.1.5 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the containments, structures, and component support system:

- Structural Monitoring Program
- Water Chemistry Control Program
- Fire Protection Program
- Borated Water Leakage Assessment and Evaluation Program
- Service Water Pond Dam Inspection
- Inservice Inspection Program

Staff Evaluation

In Tables 3.5.2-1 through 3.5.2-9 of the LRA, the applicant summarized the AMRs for the containments, structures, and components support systems and identified which AMRs it considered to be consistent with the GALL Report by referencing line items in Table 3.5.1-1.

The staff conducted an audit and review of the information provided in the LRA and program bases documents, which are available at the applicant's engineering office. On the basis of its audit and review, the staff finds that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff finds that the applicant identified applicable aging effects that are appropriate for the material-environment combinations specified.

3.5.2.1.1 Structures and Components Supports, PWR Concrete Containments (Table 3.5.2-1)

For the containment's internal structure steel liner components, the applicant, in Table 3.5.2-1 of the LRA, credited the Borated Water Leakage Assessment and Evaluation Program to manage the aging effects of loss of material. The applicant also referenced Item 3.5.1-20 from Table 3.5.1 of the LRA, which states that the Structural Monitoring Program will be credited with managing structural steel. However, Table 3.5.2-1 of the LRA does not identify this program. This aging effect does not require further evaluation, provided that components in all groups except Group 6 are within the scope of the Structural Monitoring Program. In a telephone conference on January 22, 2004, the staff requested the applicant to clarify whether the Structural Monitoring Program is credited for structural steel. The applicant confirmed during the telephone conference that Table 3.5.2-1 of the LRA should have included the Structural Monitoring Program. The applicant further stated that the omission of the Structural Monitoring Program in Table 3.5.2-1 of the LRA was an editorial error, and agreed to provide an application errata to make the correction.

By letter dated May 28, 2004, the applicant provided its application errata to correct this editorial error. In its errata, the applicant stated that for the carbon steel component type "internal structure—steel liners" in an inside environment, the Structural Monitoring Program should be added to the AMP column for managing loss of material. The staff finds the applicant's response acceptable.

The staff reviewed the Structural Monitoring Program (AMP B.4.3) and determined that the applicant had included the structural steel component group within the scope of the program. The staff documents its evaluation in Section 3.0.3.2.4 of this SER. On the basis of its review, the staff concludes that this line item is acceptable.

On the basis of its audit and review, the staff determined that for AMRs not requiring further evaluation, as identified in Table 3.5.1 of the LRA (Table 1), the applicant's references to the GALL Report are acceptable and no further staff review is required.

On this basis, 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).

Conclusion

The staff determined the applicant’s claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant’s consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Staff Review Pertaining to Recent Operating Experience and Emerging Issues

Because the GALL Report and SRP-LR were issued in July 2001, these documents do not reflect the most current recommendations for managing certain aging effects that have been the subject of recent operating experience or the topic of an emerging issue. As a result, the staff issued RAIs to determine how the applicant proposed to address these items for license renewal. The following are the applicant’s responses to these RAIs, and the staff’s evaluation of the responses.

The staff reviewed Tables 3.5.1 and 3.5.2, as well as additional evaluations provided in Section 3.5.2.2 of the LRA, “Further Evaluation of Aging Management as Recommended by NUREG-1801 for Structures and Component Supports.” The only emerging issue applicable to the AMR of FNP structures and components supports pertains to NRC ISG-3. The applicant indicated in plant-specific notes 53 and 54 of Table 3.5-2 (page 3.5-67) of the LRA that both the leaching of calcium hydroxide and the corrosion of embedded steel are considered applicable aging mechanisms for FNP based on NRC ISG-3 provisions. Because the applicant has fully adopted the NRC ISG-3 position, the staff finds the applicant’s handling of the issue acceptable. The above staff review also indicated that some additional information and clarifications were required related to (1) further evaluations recommended in NUREG-1801, and (2) the plant-specific operating experience. The staff transmitted additional RAIs to obtain this information. The staff evaluates the applicant's responses to these RAIs in Section 3.5.2.3 of this SER.

The staff evaluated the applicant‘s claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant’s consideration of recent operating experience and proposals for managing associated aging effects.

On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Recommended

Summary of Technical Information in the Application

In Section 3.5.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for structures and components support systems. The applicant provided information concerning how it will manage the following aging effects:

- aging of inaccessible concrete areas
- cracking, distortion, and increases in component stress level due to settlement; reduction of foundation strength due to erosion of porous concrete subfoundations, if not covered by the Structural Monitoring Program
- reduction of strength and modulus of concrete structures due to elevated temperature
- loss of material due to corrosion in inaccessible areas of the steel containment shell or liner plate
- loss of prestress due to relaxation, shrinkage, creep, and elevated temperature
- cumulative fatigue damage
- cracking due to cyclic loading and SCC
- aging of structures not covered by the Structural Monitoring Program
- aging management of inaccessible areas
- aging of supports not covered by the Structural Monitoring Program
- cumulative fatigue damage

Staff Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff determined whether the applicant had adequately addressed the issues that required further evaluation. In addition, the staff audited these additional evaluations against the criteria contained in Section 3.5.2.2 of the SRP-LR. The FNP Audit and Review Report documents details of the staff's FNP audit and review.

The GALL Report indicates that further evaluation should be performed for the aging effects described in the following sections of this SER.

I. Containment

The staff reviewed Section 3.5.2.2 of the LRA against the criteria in Section 3.5.2.2.1 of the

SRP-LR, which addresses several areas discussed below.

3.5.2.2.1 Aging of Inaccessible Concrete Areas

In Section 3.5.2.2.1 of the LRA, the applicant addressed aging of inaccessible concrete areas of the containment.

For inaccessible portions of the containment structure, 10 CFR 50.55a(b)(2)(ix) requires that the licensee evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

The GALL Report recommends GALL AMP XI.S2, “ASME Section XI, Subsection IWL,” for managing the aging of the accessible portions of the containment structures. The applicant credited the Inservice Inspection Program (AMP B.3.1), which the staff reviewed and concludes is acceptable. The staff documents its evaluation in Section 3.0.3.1 of this SER. Subsection IWL exempts those portions of the concrete containment that are inaccessible (e.g., foundation, belowgrade exterior walls, or concrete covered by a liner) from examination.

The applicant also credited the Structural Monitoring Program (AMP B.4.3) where accessible areas are monitored for evidence of aging effects that may be applicable to containment structures. Section 3.0.3.2.4 of this SER evaluates this program, which is consistent with GALL AMP XI.S6, “Structural Monitoring Program.” The Structural Monitoring Program will be enhanced to monitor structures and structural components which are within the scope of license renewal, but are not currently monitored by the program. Specifically, the program will be enhanced to include the belowgrade concrete of in-scope structures that are currently not monitored and can only be examined when they are exposed by excavation.

The GALL Report, Volume 2, Chapter II, Table A1 (as modified by ISG-3), recommends further evaluation to manage the aging effects for containment concrete components located in inaccessible areas if the aging mechanisms of (1) freeze-thaw, (2) leaching of calcium hydroxide, (3) aggressive chemical attack, (4) reaction with aggregates, or (5) corrosion of embedded steel are significant. Possible aging effects for containment concrete structural components resulting from these five aging mechanisms are cracking, change in material properties, and loss of material.

Freeze-Thaw

Section 3.5.2.2.1.1 of the SRP-LR does not address freeze-thaw as an aging mechanism for concrete containments because the GALL Report does not recommend further evaluation. However, ISG-3 clarifies the staff’s position that further evaluation is appropriate if the applicant’s facility is subject to moderate-to-severe weathering conditions, unless the concrete meets certain specifications and subsequent inspections have confirmed that the aging mechanism has not caused degradation of the concrete.

The applicant stated that FNP is located in a region subject to moderate weathering conditions. In the LRA, the applicant noted that FNP is close to the region of negligible weathering conditions and is not exposed to saturated water conditions. The applicant also stated that FNP concrete structures are designed in accordance with American Concrete Institute (ACI) specification ACI-318-63, “Building Code Requirements for Reinforced Concrete,” and constructed in accordance with ACI-301-66, “Specifications for Structural Concrete for Buildings,” and ASTM standards. The following requirements result in dense concrete of good quality and low permeability with resistance to aggressive chemical solutions:

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

The staff reviewed relevant operating experience to confirm that loss of material from freeze-thaw has not been observed, either through the Inservice Inspection Program or the Structural Monitoring Program.

On the basis that any concrete that satisfies the requirements of ACI 318-63 will meet the guidelines of ISG-3, as well as on the results of an audit of operating experience under the Inservice Inspection Program and the Structural Monitoring Program, the staff concludes that loss of material and cracking resulting from freeze-thaw will be adequately managed by the Inservice Inspection Program.

Leaching of Calcium Hydroxide

Section 3.5.2.2.1.1 of the SRP-LR states that cracking, spalling, and increases in porosity and permeability caused by leaching of calcium hydroxide could occur in inaccessible areas of PWR concrete and steel containments. The GALL Report, as updated by ISG-3, recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas, if specific criteria cannot be satisfied.

The GALL Report states that leaching of calcium hydroxide becomes significant only if the concrete is exposed to flowing water. Even if reinforced concrete is exposed to flowing water, such leaching is not significant if the concrete is constructed to ensure that it is dense, well cured, and has low permeability, and that cracking is well controlled.

In the LRA, the applicant stated that FNP concrete structures are designed in accordance with ACI 318-63.

On the basis that ACI 318-63 provides assurance that the applicant has met the criteria of the GALL Report and ISG-3, and that leaching of calcium hydroxide is not significant at FNP, the staff concludes that the Inservice Inspection Program is sufficient for management of increases in porosity and permeability from this aging mechanism. This aging effect does not require a plant-specific AMP.

Aggressive Chemical Attack

Section 3.5.2.2.1.1 of the SRP-LR states that cracking, spalling, and increases in porosity and permeability caused by aggressive chemical attack could occur in inaccessible areas of PWR concrete and steel containments. The GALL Report recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas, if specific criteria defined in the GALL Report and updated in ISG-3 cannot be satisfied.

The GALL Report, as updated by ISG-3, states that aggressive chemical attack is not significant unless pH is less than 5.5, chlorides are greater than 500 parts per million (ppm), or sulfates are greater than 1500 ppm. ISG-3 also states that a plant-specific program must examine representative samples of belowgrade concrete when excavated for any reason.

The applicant stated that FNP is neither located in areas exposed to sulfate or chloride attack, nor is it located near industrial plants with emissions capable of changing environmental parameters and causing degradation to concrete. The staff confirmed from water chemical analysis results that the site ground water is not aggressive. Table 2.4.7 of the FSAR present these historical results. Results from sample testing performed in 2003 show that pH values are between 6.68 and 7.14, chloride values between 2.00 and 3.74 ppm, and sulfate values between 5.25 and 6.37 ppm. In addition, to manage the aging effects for inaccessible areas, the applicant uses the Structural Monitoring Program to examine belowgrade concrete when it is exposed during excavation.

The staff reviewed the information provided in the LRA and the guidelines provided in the SRP-LR, the GALL Report, and ISG-3. The staff concludes that increases in porosity and permeability, loss of material (spalling, scaling) and cracking resulting from aggressive chemical attack are not significant for concrete in inaccessible areas. The staff concludes that a plant-specific program for examination of belowgrade concrete is not required.

Reaction with Aggregates

Section 3.5.2.2.1.1 of the SRP-LR does not address reaction with aggregates as an aging mechanism for concrete containments because the GALL Report does not recommend further evaluation. However, ISG-3 clarified the staff's position that further evaluation is appropriate if investigations, tests, or examinations demonstrate that the aggregates are reactive.

In the LRA, the applicant stated that concrete structures are designed in accordance with ACI 318-63. Nonreactive aggregates were used at FNP. Aggregates were subjected to petrographic testing in accordance with ASTM C-295-65 and C-89-66 to show that the aggregate is nonreactive. On the basis of its review, the staff concludes that the petrographic test results show that the aggregates used for concrete containment at FNP are not reactive, and therefore further evaluation is not required to address this aging effect.

Corrosion of Embedded Steel

Section 3.5.2.2.1.1 of the SRP-LR states that the loss of material caused by corrosion of embedded steel could occur in inaccessible areas of PWR concrete and steel containments. The GALL Report (updated in ISG-3) recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas, if specific criteria defined in the GALL Report cannot be satisfied.

For cracking, loss of bond, and loss of material (spalling, scaling) caused by corrosion of embedded steel, the GALL Report states that a plant-specific program is only required if the belowgrade environment is aggressive. A plant-specific program is required in ISG-3 to examine representative samples of belowgrade concrete when excavated for any reason.

In the LRA, the applicant stated that water chemical analysis results show that the site ground water is not aggressive. Table 2.4.7 of the FSAR presents these historical results. Results from sample testing performed in 2003 show pH values between 6.68 and 7.14, chloride values between 2.00 and 3.74 ppm, and sulfate values between 5.25 and 6.37 ppm. In addition, the applicant used the Structural Monitoring Program to examine belowgrade concrete when it is exposed by excavation. For corrosion of embedded steel in accessible area, the applicant manages aging using the IWL ISI for containment.

The staff reviewed Section 3.5.2.2.1 of the LRA and determined that the site ground water environment is not aggressive; subsequent sampling has shown that results have remained within the limits identified in the GALL Report. The staff concludes that, in accordance with the criteria in the GALL Report, this aging effect is not significant and is adequately managed because the aggregates are not reactive and the ground water environment is not aggressive.

The staff reviewed the results of the applicant's AMR for inaccessible concrete areas. On the basis of its review, the staff finds that the applicant appropriately evaluated those AMR results involving management of aging of inaccessible concrete areas for containment, as recommended in the GALL Report and ISG-3.

The staff determines 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).

On the basis of its review, the staff concludes that the applicant appropriately evaluated those AMR results involving management of aging of inaccessible concrete areas for containment, as recommended in the GALL Report. Because the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Cracking, Distortion, and Increases in Component Stress Level Due to Settlement; Reduction of Foundation Strength Due to Erosion of Porous Concrete Subfoundations, If Not Covered by Structural Monitoring Program

In Section 3.5.2.2.2 of the LRA, the applicant addressed (1) cracking, distortion, and increases in component stress level due to settlement, and (2) reduction of foundation strength due to the erosion of porous concrete subfoundations in the containment. The applicant credited the Structural Monitoring Program (AMP B.4.3) to manage this aging effect. The staff evaluated this program, which is consistent with GALL AMP XI.S6, "Structures Monitoring Program." Section 3.0.3.2.4 of this SER documents the staff's evaluation.

Section 3.5.2.2.1.2 of the SRP-LR states that cracking, distortion, and increase in component stress level resulting from settlement could occur in PWR concrete and steel containments. Reduction of foundation strength due to erosion of porous concrete subfoundations could also occur in all types of PWR containments. Some plants may rely on a dewatering system to lower the site's ground water level. If the plant's CLB credits a dewatering system, the GALL Report recommends verification of the continued functionality of this system during the period of extended operation. The GALL Report does not recommend further evaluation, if this activity is included in the scope of the applicant's Structural Monitoring Program.

The staff found that there are a number of nuclear reactor structures which have porous concrete foundations with high alumina cement. These foundations are susceptible to reduction in strength and settlement potential due to erosion of cement from porous concrete. FNP Units 1 and 2 are not among those plants.

In the LRA, the applicant stated that FNP does not rely on a dewatering system for control of settlement. The FNP containment foundation is constructed directly on bedrock (Lisbon formation) and is not subject to settlement. The applicant stated in Section 2B.7.3.1 of the FSAR that it has not detected any indication of settlement from the monitoring of settlement of structures. Ground water was not aggressive during plant construction and no changes in ground water conditions have been observed. Finally, the applicant included these components within the plant-specific Structural Monitoring Program, which will confirm that these aging effects are adequately managed. In this case, the GALL Report does not recommend further evaluation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated those AMR results involving management of cracking, distortion, and increase in component stress level due to settlement for containment components, as recommended in the GALL Report. Because the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature

In Section 3.5.2.2.3 of the LRA, the applicant addressed reduction of strength and modulus of concrete structures resulting from elevated temperatures in containments.

Section 3.5.2.2.1.3 of the SRP-LR states that reduction of strength and modulus of elasticity due to elevated temperatures could occur in PWR concrete and steel containments. The GALL Report calls for a plant-specific AMP and recommends further evaluation if any portion of the concrete containment components exceeds specified temperature limits (i.e., general area temperature 66 °C (150 °F) and local area temperature 93 °C (200 °F).

In the LRA, the applicant stated that during normal plant operation, solar heat load and equipment heat loads contribute to an increase in temperature of the internal environment of the concrete structures. Surface scaling and cracking may result from long-term exposure to high temperatures. The applicant credited the Structural Monitoring Program (AMP B.4.3), to manage this aging effect. The staff reviewed this program, which is consistent with GALL AMP XI.S6, "Structures Monitoring Program"; Section 3.0.3.2.4 of this SER documents the staff's evaluation. In addition, the applicant has enhanced this program to monitor aging effects attributable to elevated temperatures.

The ACI Standard 318 provides a maximum temperature limit of 150 °F for liquid, gas, or vapor in embedded piping in structural concrete. Section III, Division 2, of the ASME Code and Appendix A of ACI-349-95, "Code Requirement for Nuclear Safety-Related Concrete Structures," provide limits at which exposure to high temperatures could impair the concrete. Section III, Division 2, Subsection CC, of the ASME Code indicates that aging due to elevated temperature exposure is not significant as long as concrete temperatures do not exceed 150 °F, except for local areas surrounding penetrations which may have increased temperatures up to 200 °F. According to ACI-349, local area temperatures may reach 200 °F before special provisions are required. Higher temperatures than specified may be allowed in the concrete, if tests and/or calculations are completed to evaluate the reduction in strength which is then applied to the design allowable limit.

In 1997, the applicant proposed an increase in the allowable RV concrete support temperature from 130 °F to 190 °F. The staff raised a concern about exceeding the 150 °F limit. Recognizing the potential degradation of the reactor pressure vessel supports subjected to sustained temperatures higher than 150 °F, the applicant committed to inspect the structural components, including portions of the reactor pressure vessel supports in the containment building, as part of the Structural Monitoring Program. This program will ensure that significant cracking of reactor pressure vessel supports that could affect the structural support of the RV or cause out-of-plumb conditions will be detected and corrected. Even though FNP concrete structures and components are not exposed to temperatures which exceed the threshold for degradation, the applicant stated that it will continue to manage the concrete because of possible isolated occurrences. Therefore, change in material properties due to elevated temperature has been recognized as an aging effect requiring management at FNP for concrete structures and components inside the containment only. The applicant has enhanced the Structural Monitoring Program to include inspection requirements for containment internal concrete and for monitoring aging effects due to elevated temperature.

The staff reviewed the LRA and FSAR and determined that (1) the applicant has identified areas where localized temperature could exceed 150 °F and has committed to an AMP, (2) in most areas, containment bulk average temperature is below the ACI normal operation temperature for general areas (i.e., 150 °F), and (3) the applicant has enhanced the Structural Monitoring Program to include inspection requirements for containment concrete where the temperatures could exceed specified limits. On this basis, the staff concludes that the applicant has implemented adequate procedures for managing containment concrete degradation induced by elevated temperature.

On the basis of its review, the staff finds that the applicant has appropriately evaluated those AMR results involving management of the reduction of strength and modulus of concrete structures due to elevated temperature for containment components, as recommended in the GALL Report. Because the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.4 Loss of Material Due to Corrosion in Inaccessible Areas of Steel Containment Shell or Liner Plate

In Section 3.5.2.2.4 of the LRA, the applicant addressed the aging effect of loss of material resulting from corrosion in inaccessible areas of the containment liner plate.

Section 3.5.2.2.1.4 of the SRP-LR states that loss of material resulting from corrosion could occur in inaccessible areas of the steel containment shell or the steel liner plate for all types of PWR containments. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect for inaccessible areas, if specific criteria defined in the GALL Report cannot be satisfied, including (1) concrete meeting the requirements of ACI-318 or ACI-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 accessible 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 accessible portion of the moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with IWE requirements, and (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.

In the LRA, the applicant stated that corrosion of inaccessible areas (embedded containment liner) is not significant because concrete meeting the requirements of ACI-318 or ACI-349 and the guidance of ACI-201.2R-77, “Guide to Durable Concrete,” was used for those portions of the containment structure in contact with the embedded containment liner. The applicant monitors the concrete under the Structural Monitoring Program and the Inservice Inspection Program to ensure that it is free of penetrating cracks. The applicant monitors the moisture barrier under the Inservice Inspection Program for aging degradation. Borated water leakage in the containment structure is not a common occurrence and is monitored under the Borated Water Leakage Assessment and Evaluation Program.

The staff reviewed the plant’s operating experience and confirmed that there is no significant corrosion in the accessible areas of the containment shell or liner plate. The staff noted that (1) the applicant’s inspection did not find significant corrosion in the accessible portion of the containment liner plate, (2) the applicant credited its IWE Inservice Inspection Program for managing loss of material for the accessible portion of the containment liner plate, and (3) if significant corrosion of the accessible portions of the liner plate is observed, the applicant will inspect the inaccessible portions of the containment liner plate.

On the basis of its review, the staff finds that the applicant has appropriately evaluated those AMR results involving the management of loss of material resulting from corrosion in inaccessible areas of the steel containment shell or liner plate for containment components, as recommended in the GALL Report. Because the applicant’s AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.5 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

As stated in the SRP-LR, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature is a TLAA, as defined in 10 CFR 54.3, and TLAAs must be evaluated in accordance with 10 CFR 54.21(c)(1). The staff documents its review of the applicant’s evaluation of this TLAA in Section 4.3.4 of this SER. In performing this review, the staff followed the guidance in Section 4.5 of the SRP-LR.

3.5.2.2.6 Cumulative Fatigue Damage

As stated in the SRP-LR, cumulative fatigue damage is a TLAA, as defined in 10 CFR 54.3, and

TLAAs must be evaluated in accordance with 10 CFR 54.21(c)(1). The staff documents its review of the applicant's evaluation of this TLAA in Section 4.3 of this SER. In performing this review, the staff followed the guidance in Section 4.3 of the SRP-LR.

3.5.2.2.7 Cracking Due to Cyclic Loading and SCC

In Section 3.5.2.2.7 of the LRA, the applicant addressed the aging effects of cracking due to cyclic loading and SCC.

Section 3.5.2.2.7 of the SRP-LR states that cracking of containment penetrations (including penetration sleeves, penetration bellows, and dissimilar metal welds) due to cyclic loading or SCC could occur in containments. The staff recommends further evaluation of inspection methods to detect cracking due to cyclic loading and SCC because visual examinations (VT-3) may be unable to detect this aging effect.

The GALL AMP XI.S1, "ASME Section XI Subsection IWE," covers inspection of these items under examination categories E-B, E-F, and E-P (10 CFR Part 50, Appendix J pressure tests). Title 10, Section 50.55a, of the *Code of Federal Regulations* identifies examination categories E-B and E-F as optional during the current term of operation. To address this issue for the period of extended operation, examination categories E-B and E-F, as well as additional appropriate examinations to detect SCC in bellows assemblies and dissimilar metal welds, are warranted.

The applicant stated that penetration sleeves and bellows are considered part of the ASME Section XI, Subsection IWE pressure boundary, and both the ASME Section XI, Subsection IWE, and the 10 CFR Part 50, Appendix J portions of the Inservice Inspection Program inspect these component types. The applicant credited the Inservice Inspection Program (AMP B.3.1) to manage cracking for this component/commodity group. The staff reviewed this program and documents its evaluation in Section 3.0.3.1 of this SER.

The applicant stated that SCC is not an applicable aging mechanism for carbon steel, from which the penetration sleeves are made. The applicant did not identify any dissimilar metal welds that require aging management under this grouping. For stainless steel, SCC requires both high temperature and exposure to an aggressive environment, and the bellows are not exposed to an aggressive environment. The applicant stated that it has not experienced SCC in these components.

The staff finds that because SCC is not an effect requiring aging management for carbon steel components, no dissimilar metal welds are subject to aging management, and the only stainless steel bellows is sheltered from aggressive environments, the absence of additional inspection methods is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated those AMR results involving management of cracking due to cyclic loading and SCC for containment components, as recommended in the GALL Report. Because the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

II. Class 1 Structures

The staff reviewed Section 3.5.2.2.2 of the LRA against the criteria in Section 3.5.2.2.2 of the SRP-LR, which addresses several areas discussed below.

3.5.2.2.8 Aging of Structures Not Covered by Structural Monitoring Program

In Section 3.5.2.2.8 of the LRA, the applicant addressed aging of Class 1 structures not managed by the Structural Monitoring Program.

Section 3.5.2.2.8 of the SRP-LR states that the GALL Report recommends further evaluation of certain structure/aging effect combinations if they are not covered by the Structural Monitoring Program. This includes (1) scaling, cracking, and spalling due to repeated freeze-thaw for Groups 1–3, 5, and 7–9 structures, (2) scaling, cracking, spalling and increases in porosity and permeability due to leaching of calcium hydroxide and aggressive chemical attack for Groups 1–5 and 7–9 structures, (3) expansion and cracking due to reaction with aggregates for Groups 1–5 and 7–9 structures, (4) cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel for Groups 1–5 and 7–9 structures, (5) cracks, distortion, and increase in component stress level due to settlement for Groups 1–3, 5, and 7–9 structures, (6) reduction of foundation strength due to erosion of porous concrete subfoundation for Groups 1–3 and 5–9 structures, (7) loss of material due to corrosion of structural steel components for Groups 1–5, 7, and 8 structures, (8) loss of strength and modulus of concrete structures due to elevated temperatures for Groups 1–5 structures, and (9) crack initiation and growth due to SCC and loss of material due to crevice corrosion of stainless steel liner for Groups 7 and 8 structures. Further evaluation is necessary only for structure/aging effect combinations not covered by the Structural Monitoring Program.

The applicant stated that the Inservice Inspection Program (AMP B.3.1) and the Structural Monitoring Program (AMP B.4.3) manage all in-scope structures. The staff reviewed these programs and documents its evaluation in Section 3.0.3.1 and Section 3.0.3.2.4 of the SER, respectively. These programs identify all aging effects (e.g., cracking, loss of material, and change in material properties), regardless of the causal mechanisms.

Because the Inservice Inspection Program or the Structural Monitoring Program manage all the FNP structures, the staff concludes that the applicant has adequately addressed the aging of structures not covered by the Structural Monitoring Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated those AMR results involving management of aging of structures not covered by the Structural Monitoring Program for Class I structures, as recommended in the GALL Report. Because the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.9 Aging Management of Inaccessible Areas

In Section 3.5.2.2.9 of the LRA, the applicant addressed aging management of inaccessible areas of Class 1 structures.

Section 3.5.2.2.2.2 of the SRP-LR states that cracking, spalling, and increases in porosity and permeability due to aggressive chemical attack and cracking, spalling, loss of bond, and loss of material caused by corrosion of embedded steel could occur in belowgrade inaccessible concrete areas. The GALL Report recommends further evaluation to manage these aging effects in inaccessible areas of Groups 1–3, 5, and 7–9 structures, if specific criteria defined in the GALL Report cannot be satisfied; ISG-3 identified additional requirements. For corrosion of embedded steel in accessible areas, the applicant manages aging using the structures monitoring program for Class 1 structures.

The GALL Report (as updated by ISG-3) states that aggressive chemical attack and corrosion of embedded steel is not significant unless pH is less than 5.5, chlorides are greater than 500 ppm, or sulfates are greater than 1500 ppm. According to ISG-3, a plant-specific program is required to examine representative samples of belowgrade concrete when excavated for any reason.

The applicant stated that the requirement for aging management of inaccessible areas for containment components applies to the aging management of inaccessible areas for Class 1 structures. The staff agrees with the applicant and addresses its evaluation of the aging management of inaccessible areas for containment components in Section 3.5.2.2.1 of this SER.

III. Component Supports

The staff reviewed Section 3.5.2.2.2 of the LRA against the criteria in Section 3.5.2.2.2 of the SRP-LR, which addresses several areas discussed below.

3.5.2.2.10 Aging of Supports Not Covered by Structural Monitoring Program

In Section 3.5.2.2.10 of the LRA, the applicant addressed aging of supports not managed by the Structural Monitoring Program.

Section 3.5.2.2.3.1 of the SRP-LR states that the GALL Report recommends further evaluation of certain component support/aging effect combinations, if they are not covered by the Structural Monitoring Program. This includes (1) reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1–B5 supports, (2) loss of material due to environmental corrosion for Groups B2–B5 supports, and (3) reduction/loss of isolation function caused by degradation of vibration isolation elements for Group B4 supports. Further evaluation was necessary only for structure/aging effect combinations not covered by the Structural Monitoring Program.

The applicant stated that the Structural Monitoring Program, evaluated in Section 3.0.3.2.4 of this SER, is applicable to all components in Groups B2 through B5. The applicant also stated that no further evaluation is required for these components. The Inservice Inspection Program manages the component supports in Group B1. The applicant also stated that the Inservice Inspection Program is consistent with GALL AMP XI.S3, “ASME Section XI, Subsection IWF.” The staff documents its evaluation of the Inservice Inspection Program in Section 3.0.3.1 of this SER.

The staff determined that the program would identify reduction in concrete anchor capacity due to degradation of the surrounding concrete. GALL AMP XI.S3 invokes Table IWF-2500, which calls for the examination of connections to building structures. The staff concludes that the Inservice Inspection Program is a satisfactory alternative to the Structural Monitoring Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated those AMR results involving management of the aging of component supports not covered by the Structural Monitoring Program, as recommended in the GALL Report. Because the applicant's AMR results are otherwise consistent with the GALL Report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.11 Cumulative Fatigue Damage

As stated in the SRP-LR, the GALL Report identifies cumulative fatigue damage as a TLAA for support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports, if a CLB fatigue exists. In LRA Section 3.5.2.2.11, the applicant stated that the CLB for the support members, anchor bolts, welds, etc. does not include fatigue analyses. Generally, steel components are not prone to fatigue. For the most part, loads are applied gradually and remain constant. Support members subjected to fatigue loading conditions are accounted for by code in their design. Therefore, this item does not qualify as a TLAA, as defined in 10 CFR 54.3. The staff finds this acceptable because CLB fatigue analyses do not exist.

<u>Conclusion</u>

On the basis of its audit and review, the staff finds that the applicant's further evaluations, conducted in accordance with the GALL Report, are consistent with the acceptance criteria in Section 3.5.2.2 of the SRP-LR. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

3.5.2.3.1 PWR Concrete Containments AMR Results

In Section 3.5.2.1.1 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the PWR concrete containments structure:

- Inservice Inspection Program
- Water Chemistry Control Program
- Structural Monitoring Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.5.2-1 of the LRA, the applicant summarized the AMRs for the PWR concrete containment structure components and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-1 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component, material, environment, aging effects, and AMPs:

- abovegrade concrete dome, wall, ring girder, and buttresses
- belowgrade concrete wall and buttresses
- concrete foundation
- concrete internal structures
- personal airlock and equipment hatch

The staff concurs with the above list.

In discussing Item 3.5.1-3 (Table 3.5.1) of the LRA, the applicant asserted that the FNP AMR results were consistent with GALL. Item A3.1 of GALL (page II A3.6) recommends further evaluation regarding the SCC of containment bellows. In RAI 3.5-1, the staff requested the applicant to provide additional information regarding the containment pressure boundary bellows at FNP, relevant operating experience, and methods used to detect their age-related degradation. In the RAI, the staff noted that in many cases, VT-3 examination of IWE, and Type B, Appendix J testing could not detect such aging effects (see NRC IN 92-20).

In its response to RAI 3.5-1, dated March 5, 2004, the applicant stated that the only location where penetration bellows were used at FNP was in the fuel transfer tube assembly. The applicant provided the following description of the fuel transfer tube, including the bellows assembly, relevant operating experience, and testing:

> The fuel transfer tube penetrates the containment wall connecting the refueling canal in containment with the fuel transfer canal in the Auxiliary Building. This penetration consists of a pipe installed inside a sleeve. The tube is sealed to the steel liners in both the refueling canal and fuel transfer canal. The tube is closed with a blind flange on the containment side and a gate valve on the Auxiliary Building side. Expansion joint bellows (single-ply) provide for relative movement between containment and the Auxiliary Building structures.
>
> Portions of the fuel transfer tube are exposed to a wetted environment during certain operating modes. The portions of the fuel transfer tube exposed to this wetted environment are constructed from stainless steel. Rigorous chemistry controls limit the concentration of aggressive chemical species so this environment is not corrosive to stainless steel. In addition, the operating temperature of the water in the refueling canal and the fuel transfer canal is sufficiently low so that the bellows remain below the threshold temperature for stress corrosion cracking (i.e., <140 °F). During other operating modes the fuel transfer tube is exposed to an “Inside” environment at ambient temperature. The Inside environment is not corrosive to stainless steel. Stainless steel bellows are very compliant (flexible); therefore, sustained high tensile stress does not exist. Since a corrosive environment and a high level of sustained tensile stress do not exist for the fuel transfer tube bellows, SCC on penetration bellows is not considered an aging effect requiring management.

The staff finds the applicant’s response acceptable because it adequately justifies not explicitly considering the cracking of containment fuel transfer tube bellows an aging-management item during the extended period of operation. However, as the fuel transfer tube penetration represents the containment pressure boundary (refer to Table 3.5.2-1 of the LRA), the Water Chemistry Control and Inservice Inspection Programs will monitor the aging effects (Appendices B.3.1 and B.2.2 to the LRA).

For seals and gaskets related to containment penetrations, the staff noted that in Item 3.5.1-6 of the LRA, the applicant identified containment ISI and containment leak rate testing as the AMPs. For equipment hatches and air locks at FNP, the staff agrees with the applicant's assertion that the Leak Rate Testing Program will monitor aging degradation of seals and gaskets, as they are tested for leak rate after each opening. For other penetrations with seals and gaskets, in RAI 3.5-2, the staff requested the applicant to provide information regarding the adequacy of a Type B leak rate testing frequency to monitor aging degradation of seals and gaskets at FNP.

In its response to RAI 3.5-2, dated March 5, 2004, the applicant noted that it was using Option B of Appendix J to 10 CFR Part 50 for leak rate test of the containment. The applicant provided the response in terms of aging management and testing of electrical and mechanical penetrations. The applicant explained that the electrical penetrations have been divided into three groups for testing purposes, 4160-V, 600-V, and instrumentation/control penetrations. Approximately one-third of the electrical penetrations are to be tested every 40 months, with samples from each of the above three groups. The applicant will look at a representative sample over a short duration to identify any generic aging issue applicable to other electrical penetrations.

The applicant identified five mechanical penetrations with seals and gaskets, including (1) fuel transfer tube, (2) spare penetrations 90 and 92 used to run temporary cables inside the containment during outages (e.g., SG examinations), and (3) containment integrated leak rate testing penetrations 71 and 72, which have been modified to allow the routing of temporary cables and hoses inside the containment (e.g., SG activities). The applicant stated that these penetrations were typically opened during every refueling outage. The applicant performs an as-left test after closure following an outage.

The staff finds the response acceptable because it indicates that the electrical and mechanical penetrations involving seals and gaskets will be adequately managed under FNP's containment Inservice Inspection and Leak Rate Testing Programs to ensure the leak-tight integrity of the containment structures.

In discussion of Item 3.5.1-12 in Section 3.5.2.2.4 of the LRA, the applicant noted that it monitors the moisture barrier under the Inservice Inspection Program for aging degradation. In RAI 3.5-4, the staff noted that the industry experience indicated moisture barrier degradation with time, and that moisture accumulation in the degraded barrier may likely corrode the steel liner. The staff requested the applicant to provide information regarding the operating experience related to the degradation of the moisture barrier and the containment liner plate at FNP. The RAI also requested a discussion of acceptable liner plate corrosion before it was reinstated to the nominal thickness.

In its response to RAI 3.5-4, dated March 5, 2004, the applicant stated that the moisture barrier is located along the periphery at the mating surface between the containment liner and concrete fill at elevation 105'-6". The condition of the moisture barrier in each unit was very good with hardly any sign of cracking or flaking. Because no significant degradation of the containment liner plate and moisture barrier at the interface between the concrete fill and the containment liner plate had occurred, the applicant performed no boroscopic examination. Moreover, the applicant provided a detailed description of the liner paint pill-off, liner indentations, and liner bulging, as well as the corrective actions taken.

Based on the applicant's response, the staff observed that the applicant is vigilant in examining the pressure boundary components of the containments, and it provides an assurance that these components will be adequately managed for aging effects during the extended period of operation.

In RAI 3.5-5, with respect to LRA Item 3.5.1-15, the staff requested the following information:

> In 1985, the incident of post-tensioning anchor-head failures had occurred at FNP, Unit 2. The event is partially documented in NRC Information Notice 85-10 and its Supplement 1. Please provide a description of the subsequent actions taken, together with the operating experience as to the effectiveness of the corrective actions taken. Also, indicate, if any other actions are (and will be) continued in addition to the IWL tendon inspections to ensure the integrity of the tendon anchor-heads.

In its response to RAI 3.5-5, dated March 5, 2004, the applicant described the event in detail, and provided the following description of the corrective actions it took:

> In order to ensure the continued structural integrity of the containment tendon field anchors in both units, the following follow-up inspections and tests were performed:
>
> Following one year of service after completion of the tendon inspection and repair effort, all vertical tendon field anchors in each unit were visually inspected for evidence of moisture.
>
> Following three years of service after completion of the tendon inspection and repair effort, horizontal and dome tendon field anchors were visually inspected for evidence of moisture and evidence of failure on a random sample basis to establish a 95% probability with a 95% confidence level that no failed field anchors exist in either group.
>
> In addition to the actions described, the tendon surveillances required by the Technical Specifications were performed. Tendon surveillances since the incident do not suggest any abnormal degradation of the tendon system and the results demonstrate that containment structural integrity has been maintained continuously for both units. No additional actions beyond the IWL tendon inspections are planned during the period of extended operation to ensure the integrity of the tendon anchor-heads.

The staff finds the applicant's corrective actions and the planned actions to monitor the FNP post-tensioning system adequate and acceptable because they will ensure the integrity of the FNP post-tensioning system during the period of extended operation.

For FNP pre-stressing tendons and anchorage components, in addition to the loss of material aging effect due to corrosion, the applicant included cracking as another aging effect to be managed by its Inservice Inspection Program. The staff finds the applicant's approach consistent with the plant-specific experience at FNP and the intent of the GALL Report and is therefore acceptable.

For carbon steel liners inside the containment, in addition to crediting the Structural Monitoring Program, the applicant also credited FNP's Borated Water Leakage Assessment and Evaluation Program with its aging management. The staff finds that this coordinated approach addresses the intent of the GALL Report and is therefore acceptable.

With respect to seals, gaskets, and moisture barriers discussed above, FNP credited the Inservice Inspection Program (including the Leak Rate Test Program) with managing pressure boundary items and the Structural Monitoring Program for managing nonpressure boundary items. The staff finds that the applicant's approach meets the intent of the GALL Report and is therefore acceptable.

For FNP steel components, except steel support members, anchor bolts, and welds, the applicant credited the Structural Monitoring Program for their aging management. For the steel support members, anchor bolts, and welds, FNP's Borated Water Leakage Assessment and Evaluation Program is credited for managing their aging effects. The staff finds this approach consistent with the GALL Report and is therefore acceptable.

With respect to refueling cavity and transfer canal miscellaneous steel components, the applicant stated that Water Chemistry Control Program will manage loss of material due to corrosion. The applicant further explained that SCC is not applicable for these components because they are not subjected to high temperatures and an aggressive environment. The staff finds the applicant's justification consistent with the GALL Report and is therefore acceptable.

With respect to FNP's steel containment liner, liner anchors, and integral attachments, the applicant credited the Borated Water Leakage Assessment and Evaluation Program, in conjunction with the Inservice Inspection Program, to manage the aging of these steel elements. The staff finds the applicant's approach consistent with the GALL Report and is therefore acceptable.

The applicant's AMR for the stainless steel sump trash rack indicated that no AMP is needed for this item. This AMR result is consistent with the intent of the GALL Report. and is therefore. acceptable.

In addition to the Structural Monitoring Program, the applicant credited the Borated Water Leakage Assessment and Evaluation Program to manage corrosion caused by the leakage of borated water onto the carbon steel tri-sodium phosphate basket. This is consistent with the GALL Report and is therefore acceptable.

In Item 3.5.1-10 of the LRA, the applicant discussed the results of its AMR of the concrete structures inside FNP containments subjected to elevated temperatures. In Section 3.5.2.2.3 of the LRA, the applicant discussed operating experience in which the sustained primary shield wall temperatures were higher than the established threshold value of 150 °F. As a precautionary measure, FNP established a monitoring program for RV supports and alignment. The staff finds the monitoring program established during the CLB acceptable for managing the effects of relatively higher temperatures near reactor pressure vessel supports for the period of extended operation.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the PWR concrete containments system components with the environments described in Table 3.5.2-1 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

<u>Conclusion</u>

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.2 Auxiliary Building AMR Results

In Section 3.5.2.1.2 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the auxiliary building structure:

- Structural Monitoring Program
- Water Chemistry Control Program
- Fire Protection Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.5.2-2 of the LRA, the applicant summarized the AMRs for the auxiliary building structure components, and identified which AMRs it considered to be not consistent with the GALL Report.

<u>Staff Evaluation</u>

Table 3.5.2-2 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component, material, environment, aging effects, and AMPs:

- exterior abovegrade and belowgrade concrete, foundation, and interior concrete; roof slabs and masonry walls foundation; interior concrete

- fire doors and fire seals

- storage rack assembly

- structural steel components

The staff concurs with the above list.

With respect to the AMR results provided in Table 3.5.2-2 of the LRA (page 3.5-40) for compressible joints and seals, the staff issued RAI 3.5-7 to request the applicant to discuss FNP's past operating/inspection experience pertaining to changes in material properties and cracking of elastomers to justify that the inspection frequency adopted in the Structural Monitoring Program is adequate to ensure functionality of FNP's compressible joints and seals.

In its response to RAI 3.5-7, the applicant stated the following:

> Periodic inspection frequencies have been selected to provide assurance that any age-related

> degradation is detected at an early time so that appropriate corrective actions can be implemented. Initially, this period was set at five years so that the overall condition of each in-scope structure or structural component is inspected every five years. Subsequent inspections have verified that the compressible joints and seals are performing as required, and degradation has been detected prior to loss of function with the five year inspection frequency. The Structural Monitoring Program includes provisions to adjust the frequency of inspection based on the inspection results. The compressible joints and seals constructed of elastomer materials have performed very well at FNP. There have been minor instances of water seepage past elastomer compressible joints and seals requiring remedial action. Seepage occurred at a location on the bottom elevation of the Auxiliary Building and in the Electrical Cable Tunnels at the interface with the Auxiliary Building (near the location of the watertight doors) which is protected by a water stop. This seepage was not the result of age-related degradation but rather was a function of the local hydraulic conditions. These conditions were identified through normal plant activities including the Structural Monitoring Program, and remedial action was taken (use of hydrophilic grout). The Structural Monitoring Program continues to periodically inspect these areas as part of the spaces-based inspections.
>
> In addition to the elastomer material listed in Table 3.5.2-2, some compressible joints and seals in the Auxiliary Building are constructed of a cork material. This cork material was inadvertently omitted from the table. The cork material was used during initial forming of the concrete to fill the seismic gaps between the floor slabs and vertical walls of the Auxiliary Building and the Containment wall. The cork ensured the required gap was maintained during the forming process and acts as seal between adjoining spaces and elevations. In certain locations, these seals prevent flooding interaction between spaces.
>
> There have been isolated cases of the cork joint fillers slipping out of the gap (since the original joint design does not provide any substantial retention mechanism (other than friction between the surfaces). The cork material appears to be in good condition; however, shrinkage and differential movement between the two mating surfaces is believed to have resulted in the slippage. Where necessary, the cork was replaced, and in some cases elastomer sealant compounds were used. The Structural Monitoring Program inspection frequency is adequate to detect the degradation (slippage) of the cork material prior to loss of any intended function.

The applicant further indicated that the “compressible joints and seals” line item in Table 2.4.2.1, “Auxiliary Building Component Types Subject to Aging Management Review and Their Intended Functions,” should have included “flood barrier” as an intended function. Further, the auxiliary building AMR summary for the compressible joints and seals line item in Table 3.5.2-2 of the LRA (page 3.5-40) should have been modified accordingly.

The staff finds the applicant’s response to RAI 3.5-7 adequate and acceptable because the applicant’s program will adequately manage the aging degradation of compressible seals and joints.

In RAI 3.5-8a, the staff pointed out the following concern:

> Regarding the stainless steel penetration sleeves listed on Table 3.5.2-2 (page 3.5-43) of the LRA that are exposed to outside environment, no AMP is credited to manage aging of these components. Depending on the plant site specific parameters that define the “outside environment,” some stainless steel components exposed to sustained, aggressive outside environment might still be subjected to appreciable loss of material aging effect.

Therefore, the staff requested the applicant to discuss key characteristics of FNP’s outside environment and its past operating/inspection experience with respect to aging management of the components listed, and to justify its position that no AMP is needed for the components.

The applicant provided the following response:

> Past inspections of stainless steel penetrations and aluminum and stainless steel cable trays, conduits, ducts, and tube tracks in an outside environment have identified only minor surface oxidation and discoloration. Past inspections do not indicate any appreciable loss of material aging effect. Corrosion of stainless steel and aluminum components has typically been associated with marine/industrial environments where the presence of significant amounts of contaminants results in localized corrosion or stress corrosion. FNP is located in a rural environment away from the coastline and with few sources of industrial pollutants. These components are not insulated, eliminating the potential for the insulation to retain moisture and leach halides onto the surfaces. Rain has been found to wash contaminants off of un-insulated components, instead of concentrating them. Therefore, these components are not considered to be exposed to a chemically aggressive or acidic environment. FNP operating experience confirms this position.

The staff finds the applicant's response to RAI 3.5-8a adequate and acceptable because it provides a plant-specific and operating experience-based justification for not considering the stainless steel penetration sleeves in its AMPs.

Regarding the fire doors listed in Table 3.5.2-2 of the LRA, the applicant credited the Structural Monitoring Program to manage the loss of material aging effect. The applicant's approach is consistent with the GALL Report, and is therefore acceptable.

For carbon steel penetration sleeves in auxiliary buildings, the Structural Monitoring Program is credited to manage loss of material aging effect. This is consistent with NUREG-1801 and is therefore acceptable.

For FNP steel components, except steel support members, the applicant credited the Structural Monitoring Program to manage the aging effect for loss of material. For steel support members, the applicant credited the Borated Water Leakage Assessment and Evaluation Program to manage the aging effects resulting from boric acid corrosion. The staff finds the applicant's approach to be consistent with the GALL Report and is therefore acceptable.

The staff's RAI 3.3-17 requested the applicant to address the following two items:

> a. Referring to Table 3.3-1 of the LRA, item 3.3.1 -11 states in the discussion that the FNP Structural Monitoring Program (Appendix B.4.3) will manage loss of material of the carbon steel portions of the new fuel storage racks. Discuss applicable non-carbon steel materials (e.g., aluminum, stainless steel, etc.) that are used in FNP's new fuel rack assemblies, their environments, FNP specific aging related operating experience, and the results of their aging management review. Also, explain why these new fuel rack assemblies are not explicitly listed in section B.4.3.5, Program Scope, of the FNP's Structural Monitoring Program.
>
> b. Referring to Table 3.3-1 of the LRA, item 3.3.1-13 states in the discussion that the spent fuel storage racks are not considered susceptible to stress corrosion cracking since the temperature of the borated water in the spent fuel pool is normally less than this threshold temperature for SCC. Elaborate on FNP's use of the phrase: "...normally less than this threshold temperature for SCC," define the threshold temperature referred to therein, explain expected or applicable abnormal conditions implied in the phrase, and discuss applicable SCC related operating experience of FNP spent fuel storage racks and associated valves.

In its letter dated April 5, 2004, the applicant provided the following response to RAI 3.3-17:

> The Auxiliary Building New Fuel Storage Area is adjacent to the Spent Fuel Pool (SFP) area, but is a separate area designed for dry storage of new fuel assemblies prior to transfer into the SFP. The new fuel storage rack assemblies are located in an inside (dry) environment. The “Inside” environment is described in Section 3.0.4 of the LRA. Each rack is composed of individual vertical cells that can be fastened together in any number to form a module that can be firmly bolted to the floor of the new fuel storage area. All surfaces that come into contact with the fuel assemblies are made of austenitic stainless steel, whereas the supporting structure is carbon steel. The component type includes the structural steel rack frame members, stiffeners, and anchors into the reinforced concrete building structure.
>
> A review of FNP operating experience performed for development of the FNP LRA indicates that there has been no age-related degradation of the stainless steel material in an inside (dry) environment.
>
> A spaces approach is used for performing the Structural Monitoring Program (SMP) inspections. Therefore, the Structural Monitoring Program scope in section B.4.3.5 lists only the in-scope structure (e.g., Auxiliary Building) but not every component located inside the structure. New fuel rack assemblies are a structural component type located in the Auxiliary Building and thus are inspected by the program.

The applicant further responded to RAI 3.3-17 by stating the following:

> FNP applies a conservative threshold temperature of 140 °F for initiation of SCC in austenitic stainless steel components exposed to borated water. Extensive industry data based on actual operating experience and laboratory testing indicate that initiation of SCC is unlikely to occur at temperatures less than 140 °F unless the materials are sensitized and exposed to harsh marine wet-dry cycling conditions. This SCC threshold limit is consistent with EPRI TR 1003056, “Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 3,” November 2001.
>
> FNP maintains a 105 °F operational temperature limitation on the spent fuel pool except during refueling outages. A 130 °F operational temperature limitation is maintained during refueling outages. Actual operating temperatures in the spent fuel pool are below these operational limits. To date, there have been no fuel pool temperature excursions exceeding 140 °F. Conservatively postulated abnormal core offload or accident scenarios could potentially exceed the 140 °F threshold for initiation of SCC (FNP UFSAR, Rev. 17, Section 9.1.3.1.1) but are not representative of actual operation.
>
> A review of FNP operating experience performed for development of the FNP LRA did not identify any SCC-related experience associated with the spent fuel storage racks or FNP Spent Fuel Pool Cooling and Cleanup System austenitic stainless steel components. Therefore, existing industry data and FNP specific operating experience indicate that cracking due to SCC is not an aging effect requiring management for the FNP spent fuel storage racks and FNP Spent Fuel Pool Cooling and Cleanup System components exposed to borated water.

The staff finds that the applicant’s response to RAI 3.3-17 is consistent with the GALL Report and is therefore acceptable.

In RAI 3.5-12, the staff requested the following with respect to aging management of Group 5 liners:

> Item 3.5.1-23, Table 3.5.1 (page 3.5-27) of the LRA lists Water Chemistry and monitoring of spent fuel pool water level as AMPs credited to manage aging of Group 5 liners. FNP stated under the discussion column that AMR results are consistent with NUREG -1801 with some minor exceptions and loss of material due to localized corrosion will be managed by FNP Water Chemistry Control Program. Clarify what constitutes the above referenced “some minor exceptions”? Is spent fuel pool water level monitoring credited as part of the FNP’s AMPs for aging management of this item?

If not, provide the basis for not crediting the spent fuel pool water level monitoring program as indicated in NUREG-1801, item III A5.2-b (page III A5-10).

In its response to RAI 3.5-12, the applicant stated the following:

The Group 5 liners (spent fuel pool, refueling cavity, and canal) are age-managed by the Water Chemistry Control Program. The NUREG-1801 aging management review (AMR) results in Table 3.5.1 for item 3.5.1-23 indicate two aging effects/mechanisms for the Group 5 liners: loss of material due to crevice corrosion, and stress corrosion cracking (SCC). In the discussion column for this item, SNC states “SCC is not applicable for reactor cavity or spent fuel pool liners because it is not subject to high temperatures and an aggressive environment.” This was termed a “minor exception.” SNC provided additional information on this determination in our April 7, 2004 response to RAI 3.3-17b (SNC letter number NL-04-0473). Although SCC was determined to not be applicable, there is no impact on relying on the Water Chemistry Control Program as the AMP for the Group 5 liners.

Monitoring of the spent fuel pool water level is not credited as part of aging management for the Group 5 liners. The effectiveness of the Water Chemistry Control Program at managing crevice corrosion in stainless steels in a borated water environment has been demonstrated in industry and FNP-specific operating experience.

SNC does not consider spent fuel pool water level monitoring adequate to detect small leaks in the pool liner. The large volume of the pool, pool inventory manipulations to support fuel movement activities, and normal make-up requirements (e.g., for evaporative losses) would mask any pool level impact. FNP confirms SFP liner integrity by periodic monitoring of the pool’s leak chase drain system. This system consists of a leak chase that collects leakage into the area between the SFP liner and the concrete retaining wall. The tell-tale drain valves are opened periodically (currently done at least annually), and any water collected is volumetrically measured and sampled for boron concentration.

The staff finds that the above operating experience-based justification meets the intent of the GALL Report, and therefore RAI 3.5-12 is closed.

With respect to the applicant’s AMR results covering cable fire wrap and fire stops, the staff requested the following additional information in RAI 3.5-15:

In its response to RAI 2.3.3.13-2, the applicant asserted that cable fire wrap and fire stops consisting of Kaowool and Maranite situated in an inside environment have no aging effect requiring management; therefore, no AMP is required for the components (refer to the last table provided on page E2-19 of Enclosure 2 to SNC's letter dated April 7, 2004). The applicant is requested to provide additional information including vendor provided or lab tested material aging data of both the Kaowool and Maranite materials, and plant specific operating experience based aging data for the same in order to support the above assertion.

The applicant responded to RAI 3.5-15 by stating the following:

Additional information is provided, in the form of vendor provided aging data and plant specific aging data, for Kaowool and Marinite materials. (Note that “Marinite” was misspelled as “Maranite” in the response to RAI 2.3.3.13-2.)

Vendor data indicates that Kaowool is an inorganic ceramic fiber material that is very stable under normal and extreme plant temperatures and common plant conditions, and does not exhibit age related degradation. It is produced from kaolin, provided as a fire proof insulation blanket intended for the physical separation of divisional electrical cables. Kaowool offers excellent handleability and high temperature stability. It has a melting point of 3200 °F and a continuous use limit of 2000 °F. Kaowool does not contain organic binders, provides excellent resistance to chemical attack (except hydrofluoric and phosphoric acid and strong alkalies such as Na_2O and K_2O) and thermal properties are unaffected by oil or water, after drying.

> Vendor data indicates that Marinite boards are very durable, hard surfaced boards that do not exhibit age related degradation under normally expected plant environments and conditions. Marinite boards are incombustible structural insulation material formed from calcium silicate with inert fillers and reinforcing agents. These boards, usually ranging in thickness from ½ inch to 2 inches, can be cut or machined from 4'x8' panels into various shapes and sizes and erected as barriers to provide fire safety and temperature control. They are frequently used in fire safety applications such as fire stops, fire walls, cable trays and fire doors. Marinite structural insulation is highly damage-resistant, non-corroding, and extremely water-resistant. Marinite has a melting point greater than 2300 °F and is stable under normal ambient conditions.

> A review of specific plant operating experience does not indicate any instances of age related degradation of Kaowool fire wrap or Marinite fire stops.

The staff finds the above response adequate to resolve RAI 3.5-15 because the vendor data provided do conservatively bound the environments to which FNP cable fire wrap and fire stops are exposed. Further, a review of specific plant operating experience did not indicate any instances of age-related degradation of Kaowool fire wrap or Marinite fire stops.

With respect to the applicant's AMR results covering the sprayed on or troweled on fire-resistive material, the staff issued RAI 3.5-16, which includes the following:

> In its response to RAI 2.3.3.13-3, the applicant states, as part of its proposed "Plant-specific note 48" (refer to the last paragraph of page E2-20 of the same reference), that the sprayed-on or troweled-on fire resistive material has no aging effects requiring aging management. The applicant is requested to provide pertinent vendor generated or lab-tested data as well as plant-specific operating experience-based aging data for the sprayed-on or troweled-on fire resistive material to further support the above statement.

The applicant responded to RAI 3.5-16 by stating the following:

> The fire resistive material applied to the structural steel and doors referred to in RAI 2.3.3.13-3 include Monokote and Albi Clad 89S. Vendor data indicates that these fire resistive materials are very durable and stable materials under normally expected plant environments and conditions. Vendor information indicates that Monokote is a cementitious material that bonds tightly to steel surfaces, forming a hard surface that does not spall, dust, or flake. Testing per ASTM E937 indicates that Monokote does not promote corrosion. The vendor data states that Albi Clad 89S is a fire retardant intumescent mastic that dries to a hard, durable finish. Both Monokote and Albi Clad have undergone testing that demonstrates their fire resistance.

> A review of plant specific operating experience does not indicate any instances of age related degradation of fire resistive material on structural steel components. The Structural Monitoring Program inspects the structural steel and doors with the fire resistive material and would detect degradation of the fire resistive material coating.

The staff finds the above response acceptable because vendor data indicate that both Monokote and Albi Clad 89S fire-resistive materials are very durable and stable under normally expected plant environments and conditions. In addition, a review of plant-specific operating experience did not indicate any instances of age-related degradation of fire-resistive material on structural steel components. Therefore, RAI 3.5-16 is closed.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the auxiliary building system components with the environments described in Table 3.5.2-2 of the LRA are consistent with industry experience for these material-environment combinations.

Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.3 Diesel Generator Building AMR Results

Summary of Technical Information in the Application

In Section 3.5.2.1.3 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the diesel generator building structure:

- Structural Monitoring Program
- Fire Protection Program

In Table 3.5.2-3 of the LRA, the applicant summarized the AMRs for the diesel generator building structure components and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-3 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component, material, environment, aging effects, and AMPs:

- exterior abovegrade and exterior belowgrade concrete, foundation, and interior concrete, roof slabs, and masonry walls foundation; interior concrete

- fire doors and fire seals

- masonry walls

- structural steel components

The staff concurs with the above list.

Table 3.5.2-3 (page 3.5-45) of the LRA indicates that the compressible joints and seals consisting of fiber, foams, and ceramics used in FNP's diesel generator building that are exposed to belowgrade environments have no applicable aging effect requiring management, and therefore no AMP is credited to manage their aging. Because sustained exposure to an aggressive belowgrade environment might result in aging of these components, RAI 3.5-9 requested the applicant to discuss key characteristics of its belowgrade environment, as well as its past operating/inspection experience with respect to aging management of these components, and to justify its position that no AMP is needed for the listed components.

The applicant responded to RAI 3.5-9 by stating that the belowgrade environment at FNP is not aggressive. Soil used in the vicinity of the diesel generator building and other seismic Category I structures is controlled and compacted backfill. The ground water is considered nonaggressive because the chlorides, sulfates, and pH are well within the ranges identified as nonaggressive by EPRI TR-1002950, Revision 1, "Aging Effects for Structures and Structural Components (Structural Tools)." Recent water samples from the service water pond and an onsite construction well have yielded a pH ranging from 6.7 to 7.1 (greater than an aggressive pH value of less than 5.5), chloride solutions ranging from 2.0 ppm to 3.7 ppm (less than an aggressive chloride level greater than 500 ppm), and sulfate solutions ranging from 5.3 ppm to 6.4 ppm (less than an aggressive sulfate level greater than 1500 ppm). The applicant further stated that there is no history of aging degradation or failure of compressible joints and seals consisting of fiber, foams, and ceramics exposed to a belowgrade environment.

The staff finds that the above plant operating experience-based justification, in conjunction with the fact that the FNP site ground water is nonaggressive, forms an adequate basis for closure of RAI 3.5-9.

Regarding the nonfire doors listed in Table 3.5.2-3 of the LRA, the applicant credited the Structural Monitoring Program to manage the loss of material aging effect. The applicant's approach is consistent with the GALL Report, and is therefore acceptable.

For carbon steel penetration sleeves in the diesel generator building, the applicant credited the Structural Monitoring Program with managing the loss of material aging effect. This is consistent with the GALL Report, and is therefore acceptable.

On the basis of its review of the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the diesel generator building system components with the environments described in Table 3.5.2-2 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.4 Turbine Building AMR Results

Summary of Technical Information in the Application

In Section 3.5.2.1.4 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following program that manages the aging effects related to the turbine building structure:

- Structural Monitoring Program

In Table 3.5.2-4 of the LRA, the applicant summarized the AMRs for the turbine building structure components and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-4 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component, material, environment, aging effects, and AMPs:

- exterior abovegrade and exterior belowgrade concrete, foundation, and interior concrete and roof slabs
- structural steel components

The staff concurs with the above list.

On the basis of its review of the LRA, the staff finds that the aging effects that result from contact of the turbine building system components with the environments described in Table 3.5.2-4 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.5 Utility/Piping Tunnels AMR Results

Summary of Technical Information in the Application

In Section 3.5.2.1.5 of the LRA, the applicant identified the materials, environments, and

AERMs. The applicant identified the following program that manages the aging effects related to the utility/piping tunnel structures:

- Structural Monitoring Program

In Table 3.5.2-5 of the LRA, the applicant summarized the AMRs for the utility/piping tunnel structures components, and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-5 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component, material, environment, aging effects, and AMPs:

- exterior abovegrade and exterior belowgrade concrete
- structural steel components

The staff concurs with the above list.

Section 3.5.2.3.3 of this SER provides the staff's evaluation of compressive joints and seals listed in Table 3.5.2-5 of the LRA.

On the basis of its review of the LRA, the staff finds that the aging effects that result from contact of the utility/piping tunnels system components with the environments described in Table 3.5.2-5 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.6 Water Control Structures AMR Results

Summary of Technical Information in the Application

In Section 3.5.2.1.6 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the water control structures:

- Structural Monitoring Program

- Service Water Pond Dam Inspection
- Fire Protection Program

In Table 3.5.2-6 of the LRA, the applicant summarized the AMRs for the water control structures components, and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-6 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component (with minor variations in component types), material, environment, aging effects, and AMPs:

- exterior abovegrade and exterior belowgrade concrete, foundation and interior concrete, roof slabs, and masonry walls

- fire doors and nonfire doors

- dams, embankment, and fire seals

- structural steel components

The staff concurs with the above list.

The pond dam/dike at FNP is an earthen structure with water control components fabricated of concrete and steel. The applicant credited the Structural Monitoring Program to manage the loss of material resulting from corrosion of steel components. For dams and embankment structures, the applicant credited the Service Water Pond Dam Inspection Program to manage loss of form (earthen embankment) and loss of material aging effects. In Section B.3.3.1 of Appendix B to the LRA, the applicant asserted that it inspects the service water pond dam and spillway on a periodic basis in accordance with RG 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants.” The staff determined that the applicant’s approach is consistent with the GALL Report, and is therefore acceptable.

For carbon steel stop logs exposed to raw water, the applicant credited the Service Water Pond Dam Inspection Program with managing the loss of material aging effect. For the stainless steel traveling screen exposed to raw water, the applicant credited the Structural Monitoring Program to manage the loss of material aging effect. This approach is consistent with the GALL Report, and is therefore acceptable.

On the basis of its review of the LRA, the staff finds that the aging effects that result from contact of the water control structures system components with the environments described in Table 3.5.2-6 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.7 Steel Tank Structures (Foundations and Retaining Walls) AMR Results

Summary of Technical Information in the Application

In Section 3.5.2.1.7 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following program that manages the aging effects related to the steel tank structures:

- Structural Monitoring Program

In Table 3.5.2-7 of the LRA, the applicant summarized the AMRs for the steel tank structures components, and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-7 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component (with minor variations in component types), material, environment, aging effects, and AMPs:

- exterior abovegrade concrete (shield and retaining walls), concrete pedestals and foundation

- bolting

- structural steel components

The staff concurs with the above list.

The steel tank structures at FNP consist of concrete shield, retaining wall, pedestals, and foundation, together with various steel components and bolting. The applicant credited the Structural Monitoring Program to manage the loss of material, cracking, and change in material properties aging effects. This approach is consistent with the GALL Report, and is therefore acceptable.

On the basis of its review of the LRA, the staff finds that the aging effects that result from contact of the steel tank structures (foundations and retaining walls) system components with the environments described in Table 3.5.2-7 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.8 Yard Structures AMR Results

Summary of Technical Information in the Application

In Section 3.5.2.1.8 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the yard structures:

- Structural Monitoring Program
- Fire Protection Program

In Table 3.5.2-8 of the LRA, the applicant summarized the AMRs for the yard structures components, and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-8 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component (with minor variations in component types), material, environment, aging effects, and AMPs:

- concrete foundation
- masonry walls
- fire doors
- bolting and equipment frames and housing
- structural steel components

The staff concurs with the above list.

With the exception of the carbon steel fire doors for which the Fire Protection Program is credited to manage the loss of material aging effect, the applicant credited the Structural Monitoring Program to manage loss of material, cracking, and change of material properties aging effects for the rest of the yard structural components. The staff finds this approach consistent with the GALL Report, and is therefore acceptable.

On the basis of its review of the LRA, the staff finds that the aging effects that result from contact of the yard structures system components with the environments described in Table 3.5.2-8 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.5.2.3.9 Component Supports AMR Results

Summary of Technical Information in the Application

In Section 3.5.2.1.9 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the component supports:

- Structural Monitoring Program
- Inservice Inspection Program
- Borated Water Leakage Assessment and Evaluation Program

In Table 3.5.2-9 of the LRA, the applicant summarized the AMRs for the component supports and identified which AMRs it considered to be not consistent with the GALL Report.

Staff Evaluation

Table 3.5.2-9 of the LRA indicates that the AMR results of the following listed items are consistent with the corresponding GALL items for component (with minor variations in component types), material, environment, aging effects, and AMPs:

- concrete foundation
- masonry walls
- fire doors
- bolting and equipment frames and housing
- structural steel components

The staff concurs with the above list.

The applicant credited the Structural Monitoring Program with managing the loss of material aging effect on battery racks and RPV carbon steel supports. The applicant credited the Borated Water Leakage Assessment and Evaluation Program with managing the loss of material resulting from boric acid corrosion. This approach is consistent with the GALL Report, and is therefore acceptable.

In part b of RAI 3.5-8, the staff asked the applicant to address the observation that Table 3.5.2-9 (page 3.5-64) of the LRA indicates that FNP cable trays, conduits, ducts, and tube tracks that are made of aluminum and stainless steel and exposed to inside and outside environments have no applicable AERM, and, therefore, no AMP is credited to manage their aging. Sustained exposure to a chemically aggressive or acidic outside environment might result in aging of these components.

The applicant responded to RAI 3.5-8, part b, that past inspections of stainless steel penetrations and aluminum and stainless steel cable trays, conduits, ducts, and tube tracks in an outside environment have identified only minor surface oxidation and discoloration. Past inspections do not indicate any appreciable loss of material. Corrosion of stainless steel and aluminum components has typically been associated with marine/industrial environments in which the presence of significant amounts of contaminants results in localized corrosion or stress corrosion. The plant is located in a rural environment away from the coastline and with few sources of industrial pollutants. These components are not insulated, eliminating the potential for the insulation to retain moisture and leach halides onto the surfaces. Rain has been found to wash contaminants off uninsulated components, instead of concentrating them. Therefore, these components are not considered to be exposed to a chemically aggressive or acidic environment. Operating experience at FNP confirms this position. The staff finds the applicant's response to RAI 3.5-8 part b acceptable.

In its review of Tables 3.5.2-9 and 3.5.1 (Item 3.5.1-32) of the LRA, the staff determined that it needed additional information related to these tables and requested the applicant to respond to the following RAIs.

RAI 3.5-13 is related to ASME Class 1, 2, and 3 piping and Class MC component supports and states the following:

> For American Society of Mechanical Engineers (ASME) Class 1, 2, and 3 piping and Class MC components support members, NUREG-1801, GALL Report, calls for ASME Section XI, Subsection IWF Program to manage aging effects due to loss of material, pitting and general corrosion of carbon steel support members, welds, bolted connections, and support anchorages (refer to GALL Report III B1.1.1-a and III B1.2.1-a). However, in Table 3.5.2-9 (page 3.5-62) of the LRA, the applicant credited Structural Monitoring Program instead of the Inservice Inspection Program for managing aging of the same support members/elements. The applicant is requested to discuss the basis for taking such exceptions to the GALL Report.

RAI 3.5-14 pertains to constant and variable load spring hangers, guides, stops, sliding surfaces, and vibration isolators and states the following:

> For constant and variable load spring hangers, guides, stops, sliding surfaces, and vibration isolators listed in Table 3.5.2-9 of the LRA, GALL Report calls for ASME Section XI, Subsection IWF for aging management of these components; whereas FNP opted to credit Structural Monitoring Program for managing aging of these components. Additionally, item 3.5.1-32 in Table 3.5.1 of the LRA states a position, under its discussion column, that FNP does not consider loss of mechanical function to be an aging effect requiring management based on the plant operating experience, contrary to that of GALL Report (refer to GALL Report Sections III B1.1.3-a, III B1.2.2-a and III B1.3.2-a). The applicant is requested to justify these deviations from the GALL Report.

In its response to RAI 3.5-14, the applicant stated the following:

> SNC offers the following clarification on the applicability of the Inservice Inspection Program (ASME

Subsection IWF Program) and the Structural Monitoring Program to the component type "Constant and variable load spring hangers, guides, stops; sliding surfaces; vibration isolators (For ASME piping and components)" in LRA Table 3.5.2-9 (page 3.5-63).

Consistent with the GALL Report (items III B1.1.3-a and III B1.2.2-a), SNC confirms the FNP ISI Program (which includes the ASME Section XI, Subsection IWF Program) is credited to manage aging effects due to loss of material for this component type. SNC also credits the Structural Monitoring Program in addition to (not in lieu of), the Inservice Inspection Program for managing aging of these components. These components are also inspected under the FNP Structural Monitoring Program and therefore were identified as such in the LRA table.

As stated in the discussion column for Item 3.5.1-32 in Table 3.5.1 of the LRA, SNC does not consider loss of mechanical function (due to corrosion, distortion, dirt, overload, etc.) to be an aging effect requiring management at FNP for the Groups B1.1, B1.2 and B1.3 support members, anchor bolts, welds, spring hangers, guides, stops, and vibration isolators. Review of the FNP operating experience did not indicate loss of mechanical function due to corrosion or dirt as an aging effect at FNP. Loss of function due to distortion or overload is a design/corrective action issue and not the result of aging. Although SNC did not identify loss of mechanical function as an aging effect, the AMP credited by SNC to manage aging in these components (i.e., ISI Program) is consistent with the GALL Report program for managing loss of mechanical function.

The staff finds the above response to RAI 3.5-14 consistent with the intent of the GALL Report, and therefore RAI is considered closed.

Conclusion

On the basis of its review of the LRA and the additional information included in the applicant's response to the RAIs, the staff finds that the aging effects that result from contact of the component supports with the environments described in Table 3.5.2-9 of the LRA are consistent with industry experience for these material-environment combinations. Therefore, the staff finds that the applicant identified the applicable aging effects and associated AMPs appropriate for the material-environment combinations specified.

3.5.3 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that the aging effects associated with the containments, structures, and component supports will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging of the containments, structures, and component supports, as required by 10 CFR 54.21(d).

3.6 Aging Management of Electrical Components

The applicant described its AMR of electrical and instrumentation and controls (I&C) components in Section 3.6 of the LRA. The staff reviewed this section of the LRA to determine whether the applicant has demonstrated that the effects of aging on the electrical and I&C components will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.1 Summary of Technical Information in the Application

In Table 3.6.1 of the LRA, “Summary of the Aging Management Evaluations for Electrical Components in Chapter VI of NUREG-1801,” the applicant provided a summary comparison of its aging management activities with the aging management activities evaluated in the GALL Report for the electrical component groups. In Table 3.6.2-1 of the LRA, the applicant provided a summary comparison of the FNP aging management activities with the aging management activities evaluated in the GALL Report for the electrical component groups. In this table, the applicant also summarized the materials of construction, service environments, AERMs, and the credited AMP for each of the electrical component groups. The applicant also provided a detailed discussion of its AMR in Section 3.6.2.1.1 of the LRA.

The applicant’s AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant’s review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report in 2001.

The applicant conducts its ongoing review of plant-specific and industry operating experience in accordance with the FNP, Units 1 and 2, Operating Experience Program.

3.6.2 Staff Evaluation

The staff reviewed Section 3.6 of the LRA to determine if the applicant provided sufficient information to demonstrate that the effects of aging on the electrical components and component groups that are within the scope of license renewal and subject to an AMR 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 performed an audit and review to confirm the applicant’s claim that certain identified AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report. However, the staff did determine that the applicant presented applicable material in the LRA and identified the appropriate GALL AMPs. The staff documented its evaluations of the AMPs in Section 3.0.3 of this SER. The FNP Audit and Review Report, summarized in Section 3.6.2.1 of this SER, details the staff’s evaluation of the audit and review for these AMRs.

The staff also audited those AMRs that were consistent with the GALL Report and for which further evaluation is recommended. During the audit and review, the staff concluded that the applicant’s further evaluations were consistent with the acceptance criteria in Section 3.6.2.2 of the SRP-LR. The FNP Audit and Review Report, summarized in Section 3.6.2.2 of this SER, details the staff’s evaluation of the audit and review for these AMRs.

The staff conducted a technical review of the remaining AMRs that were not consistent with the GALL Report. The review evaluated whether the applicant identified all plausible aging effects and listed appropriate aging effects for the material-environment combinations specified. Section 3.6.2.3 of this SER documents the details of the staff’s review and evaluation for these AMRs that are not consistent with the GALL Report.

Finally, the staff reviewed the AMP summaries in the FSAR Supplement to ensure that they adequately describe the programs credited with managing or monitoring aging for the reactor system components.

Table 3.6-1 below summarizes the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in Section 3.6 of the LRA that are addressed in the GALL Report.

Table 3.6-1 Staff Evaluation for Electrical Components in the GALL Report

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Electrical equipment subject to 10 CFR 50.49 environmental qualification requirements **Item Number 3.6.1-1**	Degradation due to various aging mechanisms	EQ of electric components	TLAA	Consistent with GALL, which recommends further evaluation. (See Section 4.4)
Electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements **Item Number 3.6.1-2**	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance; electrical failure caused by thermal/ thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet UVI sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	AMP for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	Non-EQ Electrical Cables Exposed to Adverse Localized Environments and Inaccessible Medium Voltage Cables Program (Appendix B.5.6.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.6.2.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance **Item Number 3.6.1-3**	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance; electrical failure caused by thermal/ thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	AMP for electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	Non-EQ Electrical Cables Used in Instrumentation Circuits Program (Appendix B.5.6.1)	Consistent with GALL, which recommends no further evaluation. (See Section 3.6.2.1)
Inaccessible medium-voltage (2 kV to 15 kV) cables (e.g., installed in conduit or directly buried) not subject to 10 CFR 50.49 EQ requirements **Item Number 3.6.1-4**	Formation of water trees' localized damage leading to electrical failure (breakdown of insulation) caused by moisture intrusion and water trees	AMP for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	Non-EQ Electrical Cables Exposed to Adverse Localized Environments and Inaccessible Medium Voltage Cables Program (Appendix B.5.6.2)	Consistent with GALL, which recommends no further evaluation. (See Section 3.6.2.1)
Electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage **Item Number 3.6.1-5**	Corrosion of connector contact surfaces caused by intrusion of borated water	Boric acid corrosion	None	Consistent with GALL, which recommends no further evaluation. (See Section 3.6.2.1)

The staff's review of the applicant's electrical components followed one of several approaches. One approach, documented in Section 3.6.2.1, involved the staff's review of the AMR results for components in the electrical and I&C components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in Section 3.6.2.2, involved the staff's review of the AMR results for components in the electrical and I&C components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in Section 3.6.2.3, involved the staff's review of the AMR results for components in the electrical and I&C components that the applicant indicated are not consistent with the GALL Report or are not addressed in the GALL Report. The staff documented its review of AMPs that are credited to manage or monitor aging effects of the electrical components and component groups in Section 3.0.3 of this SER.

The applicant credited four AMPs to manage the aging effects associated with electrical and

I&C components. Three of these AMPs are credited to manage aging for components in other system groups (common AMPs), while the other AMP is credited with managing only electrical and I&C components. The AMPs include the following:

- Inservice Inspection Program
- External Surface Monitoring Program
- Buried Piping and Tank Inspection Program
- Non-EQ Cables Program

3.6.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Not Recommended

Summary of Technical Information in the Application

In Section 3.6.2.1.1 of the LRA, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the electrical components:

- Non-EQ Cables Program
- External Surfaces Monitoring Program
- Buried Piping and Tank Inspection Program

The applicant credited the Non-EQ Cables Program (Appendix B.5.6) to manage aging effects of all electrical components within the license renewal scope which have AERMs. This program for cables and connections includes adverse environment inspection and walkdown for non-EQ cables, as well as pull box inspections and water elimination activities for medium-voltage potentially submerged cables. It also includes special tests for certain neutron monitoring instrumentation cables. The applicant claimed that the combined AMP is consistent with GALL AMP XI.E1, “Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements,” and GALL AMP XI.E3, “Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements.” The applicant indicated that the AMP for electrical cables used in instrumentation circuits not subject to 10 CFR 50.49, and which are sensitive to a reduction in conductor insulation resistance, is consistent with GALL AMP XI.E2, with an exception.

Staff Evaluation

In Table 3.6.2-1 of the LRA, the applicant summarized the AMRs for the electrical components and identified which AMRs it considered to be consistent with the GALL Report.

The staff conducted an audit and review of the information provided in the LRA and program bases documents, which are available at the applicant’s engineering office. On the basis of its audit and review, the staff finds that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with GALL. Therefore, the staff finds that the applicant identified all applicable aging effects that are appropriate for the material-environment combinations listed.

On the basis of its audit and review, 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).

Conclusion

The staff has evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Recommended

Summary of Technical Information in the Application

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed these issues. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in Section 3.6.2.2 of the SRP-LR. The FNP Audit and Review Report provides details of the staff's audit and review.

The GALL Report indicates that further evaluation should be performed for the aging effects described in the following sections of this SER.

Staff Evaluation

3.6.2.2.1 Electrical Equipment Subject to Environment Qualification

As stated in the SRP-LR, electrical equipment subject to EQ is a TLAA, as defined in 10 CFR 54.3, and TLAAs must be evaluated in accordance with 10 CFR 54.21(c)(1). The staff documented its review of the applicant's evaluation of this TLAA in Section 4.4 of this SER. In performing this review, the staff followed the guidance in Section 4.4 of the SRP-LR.

Conclusion

The staff has evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed, so that their intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

In Table 3.6.2-1 of the LRA, the applicant summarized the AMRs for the plantwide electrical system components and identified those AMRs it considered not to be consistent with the GALL Report.

This portion of the staff review involved the AMR results that are not consistent with or not addressed in the GALL Report. In its LRA, the applicant did not address the AMR results of the electrical components which are not addressed in the GALL Report. During the staff's audit of the FNP License Renewal Program from November 3 – 7, 2003, the staff asked the applicant to address the AMR results for these electrical components and justify why AMPs are not required. The applicant responded to the staff's request in its letter dated December 5, 2003 (SNC Letter No. NL-03-2418).

3.6.2.3.1 Electrical Connectors Not Subject to 10 CFR 50.49 EQ Requirements That Are Exposed to Borated Water Leakage

Summary of Technical Information in the Application

Aging Effects

In LRA Section 3.6.2.1.1, the applicant identified the following aging effects associated with electrical components that require management:

- reduced insulation resistance
- loss of material

The applicant also indicated that it considered a borated water leakage environment for electrical connectors. However, connectors at FNP, Units 1 and 2, are protected from borated water leakage by their locations within protective enclosures and by design features which seal the enclosures along with associated conduit and cable entrances.

Aging Management Program

In LRA Table 3.6.1, the applicant stated that it found that the aging effects for this material-environment combination do not require management, and therefore no AMP is required. In LRA Table 3.6.2-1, the applicant again stated that an AMP is not required.

In LRA Section B.3.5, "Borated Water Leakage Assessment and Evaluation," the applicant stated that the FNP Borated Water Leakage Assessment and Evaluation Program implements the plant-specific commitments made in response to GL 88-05, dated May 31, 1988. The FNP Borated Water Leakage Assessment and Evaluation Program manages loss of material in areas where there are carbon steel and low-alloy steel structures or components, or electrical components, onto which borated reactor water might leak.

Staff Evaluation

Aging Effects

The staff agrees that the LRA correctly identified the aging effects associated with electrical components exposed to boric acid.

Aging Management Program

The staff agrees that an AMP for electrical connections exposed to borated water is not necessary because the design at FNP inhibits the ingress of borated water into electrical connections, and the Borated Water Leakage Assessment and Evaluation Program will address any observed borated water leakage.

The staff finds that the applicant adequately addressed the aging threat to electrical connections from borated water by the design of the connection enclosures, supplemented by its Borated Water Leakage Assessment Program, and that no separate AMP for connectors exposed to borated water is required.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.6.2.3.2 Fuse Holders

Summary of Technical Information in the Application

Aging Effects

In LRA Section 3.6.2.1.1, the applicant indicated that it gave the aging effects for fuse holders special consideration based upon the guidance of ISG-5. The applicant evaluated fuse holders for the fatigue of metal clips due to mechanical wear and thermal cycling. The fuse holders subject to an AMR are those associated with fuses that are not routinely removed for maintenance and/or surveillance. When FNP de-energizes these circuits, power is normally removed at the safety-related power supply or by opening links on terminal blocks. Therefore, FNP does not consider fatigue due to mechanical stress to be an AERM.

The operation of external equipment, such as compressors, fans, and pumps, could induce vibration in fuse holders. Since the fuse holders within the scope of this review are located in panels which are seismically mounted on their own support structure, separate from sources of vibration, FNP does not consider vibration to be an applicable aging mechanism.

Corrosion of metallic clamps could occur if the fuse holders were located in humid environments or exposed to water or boric acid leakage. The fuse holder panels are NEMA 12 rated enclosures which protect the fuse holders from external sources of moisture. In addition, these NEMA 12 enclosures are located inside rooms that protect the panels from the weather, and no sources of potential mechanical system leakage are located in proximity to the panels, which are not managed for aging. With regard to internal moisture, a review of plant-specific operating experience did not reveal any instance of aging as a result of the formation of condensation internal to the panels. Based upon recent inspections of the fuse blocks, the surface condition of the fuse clips shows no signs of corrosion. Additionally, there is no sign of moisture.

Aging Management Program

In LRA Section 3.6.2.1.1, the applicant concluded that it had not identified any AERMs for in-scope fuse holders.

In Table 3.6.2-1, the applicant again stated that an AMP was not required.

Staff Evaluation

In a letter dated March 10, 2003, the NRC forwarded to the NEI and the Union of Concerned Scientists the ISG on the screening of electrical fuse holders. The staff position indicated that fuse holders should be scoped, screened, and included in the AMR in the same manner as terminal blocks and other types of electrical connections that are currently being treated in the process. This position only applies to fuse holders that are not part of a larger assembly such as switchgear, power supplies, power inverters, battery chargers, or circuit boards. Fuse holders in these types of active components would be considered as a part of the larger assembly and not subject to an AMR.

Aging Effects

Operating experience, as discussed in NUREG-1760, “Aging Assessment of Safety-Related Fuses Used in Low- and Medium-Voltage Applications in Nuclear Power Plants,” issued May 2002, identified that aging stressors such as vibration, thermal cycling, electrical transients, mechanical stress, fatigue, corrosion, chemical contamination, or oxidation of the connection surfaces can result in fuse holder failure. The staff documented its final position on this issue in ISG-5.

Section 3.6.2.1.1 of the FNP LRA indicates that the AMR of fuse holders addressed fatigue from mechanical wear and thermal cycling and concluded that fatigue due to mechanical stress is not considered an AERM because the fuses are not routinely removed for maintenance or surveillance activities. The discussion contained in its original LRA, Section 3.6.2.1.1, did not mention the results of the thermal cycling review, nor did it address the other stressors covered in NUREG-1760.

By letter dated December 5, 2003 (SNC Letter No. NL-03-2418), the applicant supplemented its LRA, Section 3.6.2.1.1, by addressing the thermal cycling review and the remaining aging stressors not initially described in the LRA. The applicant stated that for fuse holders, it evaluated aging effects due to ambient thermal stress, radiation, general corrosion, boric acid corrosion, vibration and self-loosening of hardware, mechanical stress (fatigue), electrical transients, and thermal cycling. The applicant did not identify any AERMs. The scope of GALL AMP XI.E1 includes fuse holders, similar to other cable connectors and terminations.

The staff agreed that the LRA, together with the supplemental information provided by the applicant in its letter dated December 5, 2003 (SNC Letter No. NL-03-2418), correctly identified the aging effects associated with fuse holders.

Aging Management Program

The staff agrees that no AMP for fuse holders is required.

The staff finds that the applicant adequately addressed the aging threat to fuse holders and that ISG-5 is satisfied, no separate AMP for separately mounted fuse holders is required.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.6.2.3.3 High-Voltage Insulators

Summary of Technical Information in the Application

Aging Effects

Table 2.5.1 of the LRA identifies high-voltage insulators as a component within the scope of license renewal.

In LRA Section 3.6.2.1.1, the applicant listed the following AERMs associated with electrical components:

- reduced insulation resistance
- loss of material

However, the applicant did not address high-voltage insulators in LRA Section 3.6.2.1.1. In Table 3.6.2-1, the applicant stated that an AMP is not required for high-voltage insulators because there is no AERM.

Aging Management Program

In LRA Table 3.6.2-1, the applicant stated that there are no AERMs for high-voltage insulators.

Staff Evaluation

Aging Effects

Various airborne materials, such as dust, salt, and industrial effluents, can contaminate insulator surfaces. 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 a greater concentration of airborne particles is prevalent. Cracks have been known to occur in insulators when the cement that binds the parts together expands enough to crack the porcelain. Mechanical wear is another aging effect for strain and suspension insulators because they are subject to movement. Wind blowing the supported transmission conductor, causing it to swing from side to side, can cause movement of insulators. 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. During its audit, the staff requested the applicant to address insulator surface cracking.

In its letter dated December 5, 2003 (SNC Letter No. NL-03-2418), the applicant satisfactorily addressed this concern by stating that no airborne contaminents exist in the area around FNP, Units 1 and 2, that rain would not wash away. The applicant also stated that the type of insulators used at FNP are not subject to the cement growth cracking failure mechanism seen on other types of insulators, and operating experience has shown that the strain insulator components are designed with a sufficient strength margin to prevent cracking failures due to tension. In addition, the transmission conductors within the scope of license renewal at FNP are short spans located entirely within the high-voltage switchyard and therefore exert less tension than normally found for a transmission line. Therefore, cracking is not an AERM for FNP.

The staff agrees that the LRA, together with the supplemental information in its letter dated December 5, 2003 (SNC Letter No. NL-03-2418), correctly identified the aging effects associated with high-voltage insulators.

Aging Management Program

The staff agrees that no AMP for high-voltage insulators is required.

The staff finds that the applicant adequately addressed the aging threat to high-voltage insulators and that it correctly concluded that no separate AMP for high-voltage insulators is required.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.6.2.3.4 Metal-Enclosed Cable Bus

Summary of Technical Information in the Application

Aging Effects

Table 2.5.1 of the LRA identifies the metal-enclosed cable bus as a component within the scope of license renewal.

In LRA Section 3.6.2.1.1, the applicant listed the following AERMs associated with electrical components:

- reduced insulation resistance
- loss of material

However, the applicant did not address the metal-enclosed cable bus in Section 3.6.2.1.1.

Aging Management Program

In LRA Table 3.6.2-1, the applicant stated that no AERMs exist for the metal-enclosed cable bus.

Table 3.6.1 of the LRA states that Appendix B.5.6, "Non-EQ Cable Program," includes the insulated cable portion of the metal-enclosed cable bus.

In its letter dated December 5, 2003 (SNC Letter No. NL-03-2418), the applicant stated that it performed an AMR and concluded that an AMP is not required because the bus has no AERMs. The applicant's response did not provide any details.

<u>Staff Evaluation</u>

Aging Effects

In its letter dated April 22, 2004 (SNC Letter No. NL-04-0678), the applicant described the cable bus configuration utilized at FNP as insulated cable in a vented tray traversing from startup auxiliary transformers to switchgear locations. Cable splices are made in tap boxes, which contain aluminum channel conductors mounted on insulators. Cable conductors are equipped with connectors which are bolted to the channel conductors.

The nonsegregated phase bus ducts are constructed of the following materials:

- aluminum
- galvanized steel
- stainless steel
- porcelain
- various organic polymers
- fiberglass

The nonsegregated phase bus ducts are exposed to both inside and outside environments.

An inside environment is associated with components that are found within environmentally controlled structures. At a minimum, temperature is controlled to prevent freezing. This environment would include the auxiliary and turbine buildings for the metal-enclosed cable bus.

In an outside environment, components may be exposed to direct sunlight, precipitation, and freezing conditions. The GALL Report calls this environment weather exposed, and for the metal-enclosed cable bus it would include the low-voltage switchyard.

Aging effects for the nonsegregated phase bus ducts requiring evaluation are those associated with insulation material deterioration due to aging, moisture/debris intrusion, and bolt loosening due to thermal cycling.

Insulation Material Deterioration Due to Aging

The cable bus ducts are located both inside and outside. The metal bus duct enclosures protect the enclosed insulated cables from weather. The bus cables exit the bus duct enclosures in the low-voltage switchyard, and approximately 6 feet of the cables are exposed where they connect to the startup auxiliary transformers. The exposed cable insulation is ethylene propylene rubber (EPR) with a Hypalon (chlorosulfonated polyethylene) jacket, discussed in SAND 96-0344, “Aging Management Guideline for Commercial Nuclear Power Plants—Electrical Cable and Terminations,” issued September 1996. The cables have no significant aging effects when exposed to these conditions. Therefore, insulation material deterioration due to aging is not an AERM.

Moisture/Debris Intrusion

The cable bus duct enclosures are constructed of sheet aluminum attached to an aluminum angle frame with both welded and bolted connections. The side panels are louvered. Bus duct enclosures are located both inside and outside. Tap boxes are constructed similar to bus duct enclosures, except with solid covers. All tap boxes for in-scope cable bus ducts are located inside. Moisture and debris could enter the cable bus duct through the louvered side panels. However, this has no adverse effect on the insulated cable conductors. The solid cover design precludes the entry of moisture and debris into the tap boxes. Therefore, moisture/debris intrusion is not an AERM.

Bolt Loosening Due to Thermal Cycling

Industry experience has shown that bus ducts exposed to appreciable ohmic or ambient heating during operation may experience loosening of bolted connections related to the repeated cycling of connected loads or the ambient temperature environment. This phenomenon can occur in heavily loaded circuits (i.e., those exposed to appreciable ohmic or ambient heating) that are routinely cycled.

The cable bus duct was designed for a hottest spot temperature rise of 35 °C above 40 °C. This results in a temperature of 75 °C (167 °F). The cables contained in the cable bus duct are insulated with EPR insulation. Per Table 9.1 in the “EPRI License Renewal Electrical Handbook TR-1003057 Final Report,” issued December 2001, 167 °F equates to a 60-year life.

The portions of the metal-enclosed cable bus duct within the scope of license renewal are normally energized. Thus, routine cycling is not experienced. Connections from the bus to the equipment are made with Belleville washers, which are superior to split washers in maintaining compression force on the connections. The FNP nonsegregated phase bus ducts are designed to carry the output of the startup auxiliary transformers. The worst-case loading on any portion of the cable bus duct for either unit is approximately 65 percent. Therefore, bolt loosening due to thermal cycling is not an AERM.

A review of plant operating experience at FNP did not reveal any issues associated with the cable bus duct.

The applicant reviewed industry operating experience for problems associated with bus ducts and selected the following items for further review and disposition:

> Information Notice 89-64, “Electrical Bus Bar Failures,” was issued to address Noryl insulated medium voltage bus bar failures that occurred at several nuclear facilities. The failures identified in Information Notice 89-64 were attributed to cracking of the Noryl bus bar insulation in combination with the accumulation of moisture or debris in the bus duct housings that provided a tracking path to ground. Noryl is the General Electric Trademark name for a plastic type electrical insulation material.
>
> Information Notice 98-36, “Inadequate or Poorly Controlled, Non-Safety Related Maintenance Activities Unnecessarily Challenged Safety Systems,” notified licensees of various inadequate maintenance activities (e.g., failure to install gaskets or caulking of outdoor components) in the industry which resulted in moisture intrusion and challenges to safety related systems.
>
> Information Notice 2000-14, “Non-Vital Bus Fault Leads to Fire and Loss of Offsite Power,” informed licensees of a transient at Diablo Canyon nuclear plant caused by a failure of a bus bar due to overheating at a splice joint. Potential causes of the failure include inconsistent silver plating of aluminum bus bars, currents approaching bus capacity, undersized splice plates, torque relaxation of connecting bolts, and undetected damage from a 1995 explosion of Auxiliary Transformer 1-1.

The nonsegregated phase bus duct is characterized as all three phases contained in a single enclosure, such as exposed conductors (i.e., tube, bar, channel) insulated from the enclosure, or insulated cable. For its bus duct configuration, FNP utilizes insulated cable in a vented tray traversing from startup auxiliary transformers to switchgear. The problems documented in INs 89-64, 98-36, and 2000-14 apply to bus ducts with exposed bar conductors. The failure mechanisms identified in INs 89-64 and 98-36 do not apply to FNP because FNP bus ducts do not have exposed conductors.

Some of the potential causes of the bus bar failure addressed in IN 2000-14 could apply to other types of bus duct designs. These mechanisms include currents approaching bus capacity and torque relaxation of connecting bolts. The FNP nonsegregated phase bus ducts are designed to carry the output of the startup auxiliary transformers. The worst-case loading on any portion of the cable bus duct for either unit is approximately 65 percent. Connections from the bus to the equipment are made with Belleville washers, which are superior to split washers in maintaining compression force on the connections. Therefore, currents approaching bus capacity and torque relaxation are not applicable aging mechanisms for the nonsegregated phase bus ducts at FNP.

The staff agrees that the LRA, together with the supplemental information in its letter dated April 22, 2004 (SNC Letter No. NL-04-0678), correctly identified the aging effects associated with the metal-enclosed (nonsegregated phase) cable bus.

Aging Management Program

In its letter dated April 22, 2004 (SNC Letter No. NL-04-0678), the applicant concluded that none of the aging effects evaluated for nonsegregated phase bus ducts require management. Although the AMR concluded there were no AERMs, the Non-EQ Cables Program includes nonsegregated phase bus duct cables, as noted in the discussion column for Item 3.6.1-2 in LRA Table 3.6.1. In its letter dated July 9, 2004 (SNC Letter No. NL-04-1218), the applicant stated that it will visually inspect the portion of the bus cables that exit the bus duct enclosure in the low-voltage switchyard, where the cables are exposed for approximately 6 feet, as part of the Non-EQ Cables Program.

The staff agrees that no AMP for the metal-enclosed cable bus is required.

The staff concludes that the applicant adequately addressed the aging threat to the metal-enclosed cable bus and correctly concluded that no separate AMP for the metal-enclosed cable bus is required.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.6.2.3.5 Oil-Static Cable

Section 8.2, "Offsite Power System," of the FNP FSAR describes the oil-static cable system. The 230-kV switchyard is interconnected to the onsite electrical distribution system by four physically separated underground oil-static cables. Each cable supplies power to one of the four startup auxiliary transformers which supply power to the emergency buses for FNP, Units 1 and 2. Each of the four underground cable circuits consists of three single-conductor 500-MCM compact round aluminum conductors. Each conductor has 0.760 inches of paper insulation, zinc alloy shielding tape, and a 0.0063-inch by 188-inch zinc alloy skid wire. Metalized paper tape is provided adjacent to the conductor and also over the insulating paper tapes. The three single-conductor cables of each circuit are contained in a 6 5/8-inch O.D. by 0.250-inch wall somastic-coated pipe.

Summary of Technical Information in the Application

Aging Effects

In Section 3.6.2.1.1 of the LRA, the applicant indicated that the portion of the oil-static cable system that contains electrical conductors is both buried and outside. The pumps and piping associated with the oil-static cable pressurization system (LRA Section 2.3.3.20) are inside and buried. The interior environment for all portions of the oil-static cable system is lube oil.

Table 3.6.2-1 of the LRA lists the intended functions for the oil-static cable as pressure boundary, as well as providing electrical connections. The aging effect for the pressure boundary function is loss of material. The electrical connection function had no aging effect.

Aging Management Program

Appendix B.5.3, "External Surfaces Monitoring Program," to the LRA states that the applicant credited the FNP External Surfaces Monitoring Program with managing the loss of material in the external surfaces of specific component/commodity groups in the oil-static cable pressurization system. It also states that the applicant credited the FNP External Surfaces Monitoring Program with managing the loss of material, cracking, and change in material properties in elastomer flexible hoses used in the oil-static cable pressurization system.

Appendix B.5.4, "Buried Piping and Tank Inspection Program," to the LRA states that the scope of the FNP Buried Piping and Tank Inspection Program includes the external surfaces of the oil-static cable pressurization system's buried components from the high-voltage to the low-voltage switchyard.

In SNC Letter No. NL-04-0384, dated March 31, 2004, the applicant stated that the External Surfaces Monitoring Program will manage aging for the pressure boundary function for the portion of the oil-static cables that are above the ground. The Buried Piping and Tank Inspection Program will manage aging for the pressure boundary function of the portion of the oil-static cables that is buried. The boundary change is located where the oil supply pipe connects to the oil-static cables.

<u>Staff Evaluation</u>

Aging Effects

In its letter dated March 31, 2004 (SNC Letter No. NL-04-0384), the applicant stated that it identified no AERMs for the oil-static cable insulation system. Table 3.6.2-1 (page 3.6-11) should not have a horizontal grid line dividing the component type "oil-static cables" from the intended function of providing electrical connections. In addition, the applicant inadvertently omitted the component material of paper, but the AMR for oil-static cables has addressed this.

The applicant reviewed operating experience by searching the FNP condition reports database and by interviewing knowledgeable personnel, both within the Southern Electric System as well as industry consultants. The applicant did not identify any cases where a failure of the oil-impregnated paper insulation system occurred.

The oil-static cables are attached to vendor-supplied terminals inside potheads at the cable ends. The other end of the terminals protrude through the potheads where the vendor-supplied lugs are attached in order to make connections to switchyard conductors. The component type "switchyard bus" includes the connections between the oil-static cables and the conductors in the high- and low-voltage switchyards.

The staff agrees that the LRA, together with the supplemental information provided in its letter dated March 31, 2004 (SNC Letter No. NL-04-0384), correctly identifies the aging effects associated with the oil-static cable.

Aging Management Program

The staff agrees that no AMP for the electrical connection function of the oil-static cables is required. The staff also agrees that the External Surfaces Monitoring Program should manage age for the pressure boundary function of the portion of the oil-static cables that are above the ground. The Buried Piping and Tank Inspection Program should manage age for the pressure boundary function of the portion of the oil-static cables that are buried.

The staff finds that the applicant adequately addressed the aging threat to oil-static cables and that it correctly concluded that no separate AMP for the electrical connection function of the oil-static cables is required. The staff also finds that the applicant correctly assigned the pressure boundary function of the oil-static cables and the oil-static cable pressurization systems to the External Surfaces Monitoring Program and the Buried Piping and Tank Inspection Program.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.6.2.3.6 Switchyard Bus

Summary of Technical Information in the Application

Aging Effects

Table 2.5.1 of the LRA identifies the switchyard bus as a component within the scope of license renewal.

In LRA Section 3.6.2.1.1, the applicant listed the following AERM associated with electrical components:

- loss of material

However, the applicant did not address the switchyard bus in LRA Section 3.6.2.1.1. In Table 3.6.2-1, the applicant stated that an AMP is not required for the switchyard bus because there is no AERM.

Aging Management Program

In Table 3.6.2-1, the applicant stated that there are no AERMs for the switchyard bus.

Staff Evaluation

Aging Effects

The applicant stated that it does not consider the surface oxidation of high-voltage electrical switchyard bus connections to be a significant aging mechanism at FNP. In its letter dated December 5, 2003 (SNC Letter No. NL-03-2418), the applicant addressed this concern by stating that, based on the operating experience at FNP, the surface oxidation did not affect the function of the conductors and cable accessories. The applicant stated that it coated the connection surfaces with an antioxidant compound before tightening the connection. The staff requested confirmation that the antioxidant compound was stable through the period of operation.

In its letter dated March 22, 2004, via RAI 3.6.2-3, the staff questioned the aging effect of surface oxidation of the high-voltage switchyard bus connections. The applicant responded in its letter dated April 22, 2004 (SNC Letter No. NL-04-0678) that the antioxidant compound is a consumable which is used for initial assembly of connections and replaced as required when connections are taken apart and reassembled (e.g., during routine maintenance). The applicant also stated that the antioxidant compound has proven to be stable through many years of service at FNP. The applicant further stated that operating experience confirms that FNP has had no failures of connections caused by degradation of the compound. The staff agrees that no aging effects apply to the high-voltage switchyard bus and connections.

Aging Management Program

The staff agreed that no AMP for the high-voltage switchyard bus is required.

The staff finds that the applicant adequately addressed the aging threat to the high-voltage switchyard bus and that it correctly concluded that no separate AMP for the high-voltage switchyard bus is required.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.6.2.3.7 Transmission Conductors

Summary of Technical Information in the Application

Aging Effects

Table 2.5.1 of the LRA identifies transmission conductors as a component within the scope of license renewal.

In LRA Section 3.6.2.1.1, the applicant listed the following AERM associated with electrical components:

- loss of material

However, the applicant did not address transmission conductors in LRA Section 3.6.2.1.1. In Table 3.6.2-1, the applicant stated that an AMP is not required for transmission conductors because there is no AERM.

Aging Management Program

In Table 3.6.2-1, the applicant stated that there are no AERMs for transmission conductors.

Staff Evaluation

Aging Effects

The most prevalent mechanism contributing to the loss of high-voltage transmission conductor strength is corrosion, which includes corrosion of the steel core and aluminum strand pitting. In its letter dated December 5, 2004 (SNC Letter No. NL-03-2418), the applicant addressed the loss of strength caused by aging by referring to an Ontario-Hydro corrosion test which demonstrated satisfactory strength in an 80-year old aluminum cable-steel reinforced (ACSR) conductor. In RAI 3.6.2-4, by letter dated March 22, 2004, the staff requested confirmation that the conductors in use at FNP are identical to those tested by Ontario-Hydro. If not, the applicant should evaluate the differences. The staff also requested that the applicant indicate the useful life of the transmission conductors and their accessories, such as line terminal connectors and line splices used at FNP.

In its letter dated April 22, 2004 (SNC Letter No. NL-04-0678), the applicant responded that the ACSR conductors tested by Ontario-Hydro are representative of the overhead conductors used at FNP, and that these conductors are constructed of aluminum strands with a stranded galvanized steel reinforced center. The applicant stated that it had not determined an exact match between the conductor size and stranding for every cable used in the high-voltage switchyard at FNP and those tested by Ontario-Hydro. In its letter dated June 25, 2004 (SNC Letter No. NL-04-1096), the applicant compared the strength of the minimum-size transmission conductor used at FNP with the results of the material loss found by the Ontario-Hydro tests and concluded that sufficient margin would remain during the period of extended operation.

The applicant stated that the transmission conductor accessories, such as line terminal connectors and line splices, are made from aluminum or galvanized steel. There are no organic components to restrict the useful life of the accessories. The useful life of aluminum and galvanized steel materials in transmission system service are consistent with or greater than the ACSR conductors.

The applicant stated that the spans in the high-voltage switchyard are much less than those in a typical transmission line. Therefore, the tension exerted on the conductors and accessories is less than would be experienced in typical applications.

Aging Management Program

The staff agrees with the applicant’s conclusion that no AMP for transmission conductors is required.

The staff concludes that the applicant adequately addressed the aging effects on the transmission conductors and correctly concluded that no separate AMP for transmission conductors is required.

Conclusion

On the basis of its review, the staff finds the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in these components, as required by 10 CFR 54.21(d).

3.6.3 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated that the aging effects associated with the electrical components will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging in the electrical components, as required by 10 CFR 54.21(d).

3.7 Conclusion for Aging Management

The staff has reviewed the information in Section 3, “Aging Management Review Results,” and Appendix B, “Aging Management Programs and Activities” of the LRA. On the basis of its review of the AMR results and AMPs, the staff concludes that the applicant has demonstrated that the aging effects will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable FSAR Supplement program summaries and concludes that the FSAR Supplement adequately describes the AMPs credited for managing aging, as required by 10 CFR 54.21(d).

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4. TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section addresses the identification of time-limited aging analyses (TLAAs). Southern Nuclear Operating Company, Inc. (SNC or the applicant) discusses the TLAAs in Sections 4.2 through 4.5 of its license renewal application (LRA). Sections 4.2 through 4.5 of this safety evaluation report (SER) documents the review of the TLAAs conducted by the staff of the U.S. Nuclear Regulatory Commission (NRC) (the staff).

The TLAAs are certain plant-specific safety analyses that are based on an explicitly assumed 40-year plant life. Pursuant to Title 10, Section 54.21(c)(1), of the *Code of Federal Regulations* (10 CFR 54.21(c)(i)), the applicant for license renewal must provide a list of TLAAs, as defined in 10 CFR 54.3.

In addition, pursuant to 10 CFR 54.21(c)(2), an applicant must provide a list of plant-specific exemptions granted under 10 CFR 50.12 that are based on TLAAs. For any such exemptions, the applicant must provide an evaluation that justifies 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 the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, against the six criteria specified in 10 CFR 54.3. The applicant indicated that it had identified the calculations which met the six criteria by searching the current licensing basis (CLB). The CLB includes the final safety analysis report (FSAR) and docketed correspondence. The applicant also reviewed design calculations performed by Bechtel Power Corporation (the previous architect engineer), the Southern Company Services, Inc. (SCS) engineering organization (the current architect engineer), and the Westinghouse Electric Company (W) for the nuclear steam supply system equipment scope. The applicant listed the following applicable TLAAs in Table 4.1.2, “Potential Time-Limited Aging Analysis,” of the LRA:

- reactor vessel neutron embrittlement
- concrete containment tendon prestress
- metal fatigue
- environmental qualification of electrical equipment
- high-energy line break postulation based on fatigue cumulative usage factor
- low-temperature overpressure protection (LTOP) analyses
- fatigue analysis of the reactor coolant pump flywheel
- leak before break
- residual heat removal safety relief valve flow capacity verifications for cold overpressure mitigation analysis
- fatigue of reactor vessel supports
- silting of the ultimate heat sink

Pursuant to 10 CFR 54.21(c)(2), the applicant stated that it did not identify any exemptions granted under 10 CFR 50.12 that were based on a TLAA, as defined in 10 CFR 54.3.

4.1.2 Staff Evaluation

In LRA Section 4.1, the applicant identified the TLAAs applicable to FNP, Units 1 and 2, and discussed exemptions based on these TLAAs. The staff reviewed the information to determine whether the applicant had provided adequate information to meet the requirements of 10 CFR 54.21(c)(1) and 10 CFR 54.21(c)(2).

As defined in 10 CFR 54.3, TLAAs are analyses that meet the following six criteria:

(1) involve systems, structures, and components within the scope of license renewal, as delineated in 10 CFR 54.4(a)

(2) consider the effects of aging

(3) involve time-limited assumptions defined by the current operating term (i.e., 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 delineated in 10 CFR 54.4(b)

(6) are contained or incorporated by reference in the current licensing basis

The applicant provided a list of common TLAAs from NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plant,” dated July 2001. The applicant listed those TLAAs that are applicable to FNP, Units 1 and 2, in Table 4.1.2, Potential Time-Limited Aging Analysis, of the LRA.

As required by 10 CFR 54.21(c)(2), an applicant must provide a list of all exemptions granted under 10 CFR 50.12 which are determined to be based on a TLAA and which are evaluated and justified for continuation through the period of extended operation. In its LRA, the applicant stated that it performed a search of the FNP docketed correspondence, the operating licenses, and the FSAR, and evaluated each exemption in effect for TLAA applicability. The applicant did not identify any TLAA-based exemptions. On the basis of the information provided by the applicant with regard to the process used to identify TLAA-based exemptions, as well as the results of the applicant’s search, the staff finds that the applicant identified no TLAA-based exemptions which are justified for continuation through the period of extended operation, in accordance with 10 CFR 54.21(c)(2).

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), and has confirmed that no exemptions to 10 CFR 50.12 have been granted on the basis of a TLAA, as required by 10 CFR 54.21(c)(2).

4.2 Reactor Vessel Neutron Embrittlement

The applicant's design contains TLAAs that address the effects of neutron irradiation embrittlement of the reactor vessels (RVs) for both units. The calculations have been updated to address the additional 20 years of operation, for which 54 effective full-power years (EFPYs) are sufficient to cover the current and extended operating term. These calculations include (1) the peak fluence values used to determine the limiting RV beltline materials, (2) the Charpy upper-shelf energy (USE) and the reference temperature for pressurized thermal shock (RT_{PTS}), (3) the pressure and temperature (P-T) operating limit curves, and (4) the adjusted reference temperatures (ART).

4.2.1 Neutron Fluence

4.2.1.1 Summary of Technical Information in the Application

The applicant calculated neutron fluences using a discrete-ordinates transport method, satisfying the requirements set forth in Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," dated March 2001. The updated calculations show that the margins required in Appendix G will be maintained, even after 54 EFPYs of operation. The applicant provided the following table which summarizes the peak fluence values for FNP Units 1 and 2 associated with 54 EFPYs of operation.

0/ Fluence			**45/ Fluence**		
Surface	**1/4T**	**3/4T**	**Surface**	**1/4T**	**3/4T**
FNP Unit 1 (54 EFPY)					
6.41	4.00	1.55	2.01	1.25	0.487
FNP Unit 2 (54 EFPY)					
6.29	3.92	1.52	2.04	1.27	0.494

Note: All fluence values are in units of 10^{19} n/cm^{2}E > 1 MeV.

4.2.1.2 Staff Evaluation

RG 1.190 provides guidance regarding acceptable methods for the benchmarking of vessel fluence methodologies based on the requirements of General Design Criterion (GDC) 31, "Fracture Prevention of Reactor Coolant Pressure Boundary," and, in part, on GDC 14, "Reactor Coolant Pressure Boundary," and GDC 30, "Quality of Reactor Coolant Pressure Boundary." Therefore, the staff based its review of the peak vessel fluence evaluation for FNP, Units 1 and 2, on the adherence of the calculational method to the guidance in RG 1.190.

The staff's review of WCAP-14687, "Joseph M. Farley Units 1 and 2, Radiation Analysis and Neutron Dosimetry Evaluation," dated June 1996, indicates that this is the surveillance capsule analysis report for FNP, Unit 1, Capsule W, which was removed at the end of cycle 12. The fluence values from WCAP-14687 that the applicant cited in the FNP, Unit 1, LRA for 32 and 54 EFPYs were calculated in accordance with the guidance in RG 1.190. The calculated 54-EFPY-fluence values from WCAP-14687 are therefore acceptable for use by the applicant. The staff confirmed that the 54-EFPY-fluence values cited in WCAP-14687 were the same 54-EFPY-fluence values for FNP, Unit 1, that the applicant cited in Section 4.2.1 and Table 4.2.1 of the FNP LRA.

The staff's review of WCAP-15171, "Analysis of Capsule Z from the Alabama Power Company, Joseph M. Farley Nuclear Plant, Unit 2, Reactor Vessel Radiation Surveillance Program," dated February 1999, indicates that this is the surveillance capsule report for Capsule Z from FNP, Unit 2. The report meets the guidance in RG 1.190. The fluence values in WCAP-15171 cited by the applicant were calculated in accordance with the guidance in RG 1.190 for 54 EFPYs of operation; therefore, the staff considers these values to be acceptable for use by the applicant. The staff confirmed that the 54-EFPY-fluence values cited in WCAP-15171 were the same 54-EFPY-fluence values for FNP, Unit 2, that the applicant cited in Section 4.2.1 and Table 4.2.1 of the FNP LRA.

The pressure-temperature limits report (PTLR), issued in 1998, cites WCAP-14040-A, Revision 2, for fluence methodology. This Westinghouse report was issued before RG 1.190. The applicant submitted WCAP-16221 (which contains the latest surveillance capsule analysis) to demonstrate the application of the methodology (Ref. 2). During a conference call held on May 26, 2004, the applicant agreed to update the methodology references in the FNP PTLR. By letter dated June 4, 2004 (SNC Letter No. NL-04-0933), the applicant provided its supplemental information concerning reactor vessel beltline neutron fluence values applicable to a postulated 20-year license renewal period. The applicant restated that the fluence calculation conforms to the guidance in RG 1.190.

The staff reviewed the submitted information and agrees that the fluence calculational methodology complies with the guidance in RG 1.190, and is, therefore, acceptable. Values of vessel fluence calculated in this manner are acceptable for application to pressurized thermal shock (PTS) (10 CFR 50.61), to pressure temperature limits to satisfy the requirements of Appendices G and H to 10 CFR Part 50, and for the calculation of the USE.

The applicant used the peak clad-to-base metal interface fluence values from References 1 and 2 in the adjusted reference temperature (RT_{PTS}) value calculations for the FNP PTS assessments. The staff evaluated the PTS assessments for the extended period of operation in Section 4.2.3 of this SER. The applicant also used the peak inside surface fluence values to calculate 1/4T and 3/4T fluence values for both units based on the attenuation formula in RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," dated May 1988. The staff finds this to be acceptable. The 1/4T and 3/4T neutron fluences are used in the calculation of the 1/4T and 3/4T adjusted reference temperatures (1/4T and 3/4T RT_{NDT} values), which are inputs to the P-T limits documented in the FNP PTLR. The 1/4T neutron fluence values are also used as inputs to the USE value assessments. The staff evaluates the TLAAs for the 54-EFPY 1/4T and 3/4T RT_{NDT} values and the 54-EFPY USE assessments in Sections 4.2.2 and 4.2.4 of this SER, respectively.

WCAP-14689, Revision 6, is the most current licensing basis document citing the 54-EFPY 1/4T and 3/4T neutron fluences for FNP, Units 1 and 2. The 54-EFPY-fluence values reported in WCAP-14689, Revision 6, for FNP, Units 1 and 2, are based on acceptable values cited in WCAP-14687 and WCAP-15171, which applied a methodology consistent with RG 1.190 to calculate the 54-EFPY-fluence values. Therefore, the staff concludes that the 1/4T and 3/4T fluences for 54 EFPYs reported in WCAP-14689, Revision 6, are acceptable. The staff confirmed that the 1/4T and 3/4T fluence values for FNP, Units 1 and 2, reported in LRA Section 4.2.1 for 54 EFPYs of operation were the same as the 1/4T and 3/4T neutron fluence values for the units reported in WCAP-14689, Revision 6.

4.2.1.3 FSAR Supplement

As required by 10 CFR 54.21(d), the FSAR supplement for a facility must contain a summary description of the evaluation of each TLAA proposed for the period of extended operation.

The staff determined that Appendix A to the LRA (FSAR Supplement) did not include a summary description for the TLAA in LRA Section 4.2.1, "Neutron Fluence." The staff recognizes that the applicant calculated fluence values to 54 EFPYs (i.e., the end of the requested license extension). However, the operating assumptions in these calculations could change, for example, with the introduction of new fuel, new material properties, etc. In such an instance, 10 CFR 50.61 requires recalculation of the fluence and reevaluation of the material properties. Because the applicant had identified the recalculation of the neutron fluence values as a TLAA for the FNP units, the staff requested that a corresponding FSAR Supplement summary description for LRA Section 4.2.1 be included in the FSAR Supplement for the application. The staff identified this request as RAI 4.2.1.3-1.

In its response to RAI 4.2.1.3-1 (SNC Letter No. NL-04-0617), dated April 16, 2004, the applicant provided the following FSAR Supplement summary description for the TLAA on neutron fluence calculations:

> A.4.1.5 Neutron Fluence Calculation
>
> SNC updated the reactor vessel neutron embrittlement calculations including the neutron fluence calculations for the critical components of the reactor vessel for 54 EFPY in accordance with 10 CFR 54.21(c)(1)(ii). The neutron fluence values that apply for the current operating conditions at FNP are summarized in the Pressure and Temperature Limits Report (PTLR) for each unit. When the PTLR is updated to include P-T limit curves that bound the current level of neutron embrittlement for the unit, changes in neutron fluence values are included.

The applicant's response to RAI 4.2.1.3-1 and FSAR Supplement summary description for the TLAA on neutron fluence calculations indicate that the neutron fluence calculations have been updated through 54 EFPYs of power operation and will be incorporated into the PTLR for FNP, Units 1 and 2. The staff approved the PTLR for FNP, Units 1 and 2, in a safety evaluation and license amendment dated March 31, 1998. The PTLR process allows the applicant to periodically update the P-T limits and the low-temperature overpressure (LTOP) system setpoints without the need for requesting a license amendment to the Technical Specifications (TS) under the NRC's 10 CFR 50.90 process. The PTLR process is based on the NRC's approval of a required standard methodology for the generation of the P-T limits and LTOP setpoints. This approach includes the calculational methodology for periodically updating the neutron fluence values for the units before the bounding neutron fluence values in the current version of the PTLR are exceeded. Section 4.2.1.2 of this SER demonstrates that the applicant has calculated acceptable limiting clad-to-base metal interface, 1/4T, and 3/4T neutron fluence values for FNP, Units 1 and 2, through 54 EFPYs. WCAP-16221-NP specifies updates to the limiting clad-to-base metal interface, 1/4T, and 3/4T neutron fluence values for FNP, Unit 1. This report was docketed for FNP, Unit 1, on April 16, 2004. The report was submitted to meet the surveillance data reporting requirements of 10 CFR Part 50, Appendix H, and provided the Charpy impact data, neutron fluence data, tensile test data, and alloying chemistry data for FNP, Unit 1, Capsule V, which was removed from the FNP, Unit 1 RV in the spring of 2003. This report also updated the 54-EFPY limiting clad-to-base metal interface, 1/4T, and 3/4T neutron fluence values for the FNP, Unit 1 RV and reassessed all previous surveillance data for FNP, Unit 1, Capsules Y, U, X, and W.

According to FNP TS 5.6.6, the applicant will be required to incorporate the recent updates to the limiting 54-EFPY clad-to-base metal interface, 1/4T, and 3/4T neutron fluence values for FNP, Unit 1, into the FNP PTLR. The staff concludes that the applicant's FSAR Supplement summary description for the TLAA on neutron fluence calculations is acceptable because (1) the applicant is using an acceptable methodology to generate the limiting clad-to-base metal interface, 1/4T, and 3/4T neutron fluence values, (2) the applicant's FSAR Supplement summary description indicates that the neutron fluence values have been updated through 54 EFPYs, and (3) consistent with TS 5.6.6, the applicant will update the PTLR to incorporate the 54-EFPY neutron fluence values and any TLAAs that are dependent on these values before the P-T limits for 54 EFPYs are required to be implemented. Therefore, RAI 4.2.1.3-1 is resolved. The impacts of the updated neutron fluence values for FNP, Unit 1, on the limiting USE, RT_{PTS} values, and 1/4T and 3/4T RT_{NDT} values are evaluated in Section 4.2.2.2, 4.2.3.2, and 4.2.4.2 of this SER, respectively.

4.2.1.4 Conclusion

The staff has reviewed the applicant's TLAA on neutron fluence, as summarized in Section 4.2.1 of the LRA, and has determined that the applicant's calculation of the neutron fluence values, as projected through the expiration of the extended period of operation for the FNP, Units 1 and 2, is in conformance with the staff's guidance in RG 1.190. The staff therefore concludes that the applicant's TLAA for neutron fluence complies with the staff's acceptance criterion for TLAAs in 10 CFR 54.21(c)(1)(ii), and that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation, as required by 10 CFR 54.21(c)(1). The staff also concludes that the FSAR Supplement contains an appropriate summary description of the TLAA on PTS for the period of extended operation, as required by 10 CFR 54.21(d).

4.2.2 Upper-Shelf Energy

4.2.2.1 Summary of Technical Information in the Application

Section 4.2.2 of the LRA stated that the RV beltline materials must maintain a Charpy USE of no less than 50 ft-lb throughout the life of the RV, unless it is demonstrated, in a manner approved by the Director, Office of Nuclear Reactor Regulation (NRR), that lower values of Charpy USE will provide margins of safety against fracture equivalent to those required by Appendix G to Section XI of the American Society of Mechanical Engineers (ASME) Code. The applicant has projected these analyses to the end of the extended period of operation, in accordance with the approved methods of RG 1.99, Revision 2. The applicant stated the most limiting Unit 1 locations for USE are the Lower Shell Longitudinal Weld Seams 20-894A and B (Heat No. 90099, at the 45*I* azimuth), which have a projected End of Life (EOL) USE of 52.8 ft-lb. For Unit 2, the limiting USE location is Intermediate Shell Plate B7212-1 (on the basis of surveillance capsule data), which has a projected EOL USE of 58 ft-lb. The LRA included a summary of the results for the plant's beltline materials.

4.2.2.2 Staff Evaluation

Section IV.A.1 to 10 CFR Part 50, Appendix G, provides the Commission's requirements for demonstrating that RVs in U.S. pressurized-water reactor (PWR)-type light water reactors will have ductility throughout their service lives. The rule requires RV beltline materials to have USE values equal to or above 75 ft-lb when the materials are in the unirradiated condition, and equal to or above 50 ft-lb throughout the licensed operating period. RG 1.99, Revision 2, ?Radiation Embrittlement of Reactor Vessel Materials," provides an expanded discussion regarding the calculations of USE values and describes two methods for determining USE values for RV beltline materials, depending on whether or not a given RV beltline material is represented in the plant's Reactor Vessel Material Surveillance Program.

The applicant provided its USE assessments for the RV beltline materials of FNP, Units 1 and 2, in Tables 4.2.2-1 and 4.2.2-2 of the application, respectively. The USE assessments were based on the 1/4T neutron fluence values listed in LRA Table 4.2.1. These neutron fluence values are based on the projected values at the end of the extended period of operation (i.e., 54 EFPYs).

The staff performed independent calculations of the USE values for the RV beltline materials through the expiration of the extended period of operation for FNP, Units 1 and 2. The staff based its independent calculations on the 1/4T neutron fluence values listed in LRA Table 4.2.1 for the FNP RVs. The staff applied the calculational methods in RG 1.99, Revision 2, as its methodology for performing the independent USE calculations. The staff determined that at FNP, Unit 1, Lower Shell Axial Welds 20-984 A and B (Heat No. 90099) are the limiting beltline materials for USE. The staff calculated a USE value of 53.1 ft-lb for these welds at 54 EFPYs. This value is in good agreement with the 54-EFPY USE value calculated by the applicant for these welds (i.e., 52.8 ft-lb). Both of these values meet the acceptance criterion in 10 CFR Part 50, Appendix G, for maintaining the USE values of the RV beltline materials above 50 ft-lb throughout the licensed operating period. The staff confirmed that the recent updates to the surveillance data for FNP, Unit 1, as reported in WCAP-16221-NP (i.e., the surveillance capsule report for FNP Unit 1, Capsule V), did not change the limiting USE material and USE value for FNP, Unit 1.

The staff determined that FNP, Unit 2, Intermediate Shell Plate B7212-1 (Heat No. C7466-1) is the limiting beltline material for USE. The staff calculated a USE value of 57.9 ft-lb for this plate at 54 EFPYs. This value is in good agreement with the 54-EFPY USE value calculated by the applicant for this material (i.e., 58 ft-lb). Both of these values meet the acceptance criterion in 10 CFR Part 50, Appendix G, for maintaining the USE values of the RV beltline materials above 50 ft-lb throughout the licensed operating period.

Based on these assessments, the staff determined that the RVs at FNP, Units 1 and 2, will maintain an acceptable level of USE throughout the expiration of the units' extended periods of operation. The staff therefore concludes that the applicant's TLAA for USE, as given in Section 4.2.2 of the LRA, complies with the requirements of 10 CFR Part 50, Appendix G.

4.2.2.3 FSAR Supplement

Section A.4.1.1 of the LRA includes the following FSAR Supplement summary description for the TLAA on USE:

> Appendix G of 10 CFR Part 50 requires that the reactor vessel beltline materials must maintain a Charpy USE of no less than 50 ft-lbs throughout the life of the reactor. SNC has projected the FNP analyses to the end of the period of extended operation for the limiting component of the beltline region materials. The limiting Unit 1 location has a projected end-of-life (EOL) USE of 52.8 ft-lbs. For Unit 2, the limiting USE location has a projected EOL USE of 58 ft-lbs. These TLAAs have been shown to be acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

The applicant's FSAR Supplement summary description is consistent with the staff analysis for the TLAA on USE presented in Section 4.2.2.2 of this SER. The FSAR Supplement summary description summarizes the applicable USE requirements that must be met to ensure continued compliance with 10 CFR Part 50, Appendix G, and demonstrates why the RV beltline materials at FNP, Units 1 and 2, will be in compliance with the applicable requirements in 10 CFR Part 50, Appendix G, as projected through the expiration of the extended period of operation for the units. The staff therefore concludes that the FSAR Supplement summary description for the TLAA on USE is acceptable.

4.2.2.4 Conclusion

The staff has reviewed the applicant's TLAA on USE, as summarized in Section 4.2.2 of the LRA, and has determined that the RV beltline materials at FNP, Units 1 and 2, will continue to comply with the staff's USE requirements detailed in 10 CFR Part 50, Appendix G, throughout the extended period of operation. The staff therefore concludes that the applicant's TLAA for USE complies with the staff's acceptance criterion for TLAAs in 10 CFR 54.21(c)(1)(ii), and that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation, as required by 10 CFR 54.21(c)(1). The staff also concludes that the FSAR Supplement contains an appropriate summary description of the TLAA on USE for the period of extended operation, as required by 10 CFR 54.21(d).

4.2.3 Pressurized Thermal Shock

4.2.3.1 Summary of Technical Information in the Application

In Section 4.2.3 of the LRA, the applicant addressed 10 CFR 50.61 which requires licensees to protect against PTS transients in PWRs. The applicant stated that the screening criterion in 10 CFR 50.61 is 270 °F for plates, forgings, and axial welds and 300 °F for circumferential welds. According to this regulation, if the calculated RT_{PTS} for the limiting reactor beltline materials is less than the specified screening criterion, then the vessel is acceptable with regard to the risk of vessel failure during postulated PTS transients.

The applicant has updated the RT_{PTS} calculations for Units 1 and 2 to cover the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(ii). The applicant used methods to calculate the RT_{PTS} which are consistent with RG 1.99, Revision 2. The applicant concluded that the screening criteria are met for both units. The LRA presents a summary of the results of these calculations. The applicant stated that the limiting material for Unit 1 is the Lower Shell Plate B6919-1, which has 54 EFPY RT_{PTS} value of 191 °F. The applicant stated that the limiting material for Unit 2 is the Intermediate Shell Plate B7212-1, which has a 54 EFPY RT_{PTS} value of

208 °F. In accordance with the Reactor Vessel Surveillance Program, the applicant may update the RT_{PTS} calculations to include credible data from the analysis of future surveillance capsules.

4.2.3.2 Staff Evaluation

Title 10, Section 50.61, of the *Code of Federal Regulations* provides the Commission's requirements for demonstrating that RVs in U.S. PWR facilities will have adequate protection against the consequences of PTS events throughout their licensed period of operation. The rule requires licensees to calculate an adjusted reference temperature value for PTS (i.e., the RT_{PTS} value) for each base metal and weld material located in the beltline region of the plant's RVs. The rule sets a screening limit of 270 °F for RT_{PTS} values that are calculated for base metals (i.e., forging and plate materials) and axial weld materials and a screening limit of 300 °F for RT_{PTS} values that are calculated for circumferential weld materials. The rule also provides an expanded discussion regarding how the calculations of RT_{PTS} values should be performed and describes two methods for determining RT_{PTS} values for RV beltline materials, depending on whether or not a given RV beltline material is represented in a plant's Reactor Vessel Material Surveillance Program.

The applicant provided its RT_{PTS} value assessments for the RV beltline materials of FNP Units 1 and 2 in Tables 4.2.3-1 and 4.2.3-2 of the LRA, respectively. The applicant's RT_{PTS} value assessments for the FNP units are based on the fluence values listed in LRA Table 4.2.1 for the clad-to-base metal location of the RVs, as projected to the end of the extended period of operation (i.e., 54 EFPYs).

The applicant reported that Lower Shell Plate B6919-1 (Heat No. C6940-1) was the limiting material at FNP, Unit 1, for PTS and calculated an RT_{PTS} value of 191 °F for this material at 54 EFPYs. To verify the validity of the applicant's limiting 54-EFPY RT_{PTS} value, the staff performed independent calculations of the RT_{PTS} values for the FNP, Unit 1 RV through the period of extended operation. The staff determined that for FNP, Unit 1, Intermediate Shell Plate B6919-1 (Heat No. C6940-1) is the limiting RV beltline material for PTS. The staff calculated an RT_{PTS} value of 184.1 °F for this material at 54 EFPYs using available, credible surveillance data for the heat of material at the time of the LRA submission.

The staff noted and confirmed that on April 16, 2004, the applicant submitted WCAP-16221-NP for FNP, Unit 1. The applicant submitted this report to meet the surveillance data reporting requirements of 10 CFR Part 50, Appendix H, and to provide the Charpy impact data, neutron fluence data, tensile test data, and alloying chemistry data for FNP, Unit 1, Capsule V, which was removed from the FNP, Unit 1 RV in the spring of 2003. This report also updated the 54-EFPY limiting inside diameter (ID), 1/4T, and 3/4T neutron fluence values for the FNP, Unit 1, RV and reassessed all previous surveillance data for FNP, Unit 1, Capsules Y, U, X, and W. The staff performed an independent PTS assessment, using the revised surveillance capsule data for the unit reported in WCAP-16221-NP, and determined that the revised surveillance data increases the limiting RT_{PTS} value for FNP, Unit 1, to 195 °F, as based on the RT_{PTS} calculation for Lower Shell Plate B6919-1 (Heat No. C6940-1). This demonstrates that FNP, Unit 1, RV is a plate-limited RV, and the revised 54-EFPY RT_{PTS} value of 195 °F continues to meet the PTS screening criteria of 270 °F for plate-limited RVs. Therefore, the staff concludes that the FNP, Unit 1 RV will meet the requirements of 10 CFR 50.61 through the expiration of the extended period of operation.

The applicant reported that Intermediate Shell Plate B7212-1 (Heat No. C7466-1) was the limiting material at FNP, Unit 2, and calculated an RT_{PTS} value of 208 °F for this material at 54 EFPYs. To verify the validity of the applicant's limiting 54-EFPY RT_{PTS} value, the staff performed independent calculations of the RT_{PTS} values for the FNP, Unit 2 RV through the period of operation. The staff determined that at FNP, Unit 2, Intermediate Shell Plate B7212-1 (Heat No. C7466-1) is the limiting beltline material for PTS. The staff calculated an RT_{PTS} value of 208.8 °F for this plate material at 54 EFPYs. This value agrees with the limiting material and RT_{PTS} value reported by the applicant. Therefore, the staff concludes that the FNP, Unit 2 RV will meet the requirements of 10 CFR 50.61 through the expiration of the extended period of operation.

4.2.3.3 FSAR Supplement

Section A.4.1.2 of the LRA includes the following FSAR Supplement summary description for the TLAA on PTS:

> The requirements of 10 CFR 50.61 provide for protection against pressurized thermal shock events in pressurized water reactors. The screening criterion in § 50.61 is 270 F for plates, forgings, and axial welds and 300 F for circumferential welds. According to this regulation, if the calculated RT_{PTS} for the limiting reactor beltline materials is less than the specified screening criterion, then the vessel is acceptable with regard to the risk of vessel failure during postulated pressurized thermal shock.
>
> SNC has updated the RT_{PTS} calculations for FNP Units 1 and 2 to include the period of extended operation, and has determined that the screening criteria are met for both units. The limiting material for FNP Unit 1 has a 54 EFPY RT_{PTS} value of 191 F. The limiting material for FNP Unit 2 has a 54 EFPY RT_{PTS} value of 193 F. These TLAAs have been shown to be acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

The applicant's FSAR Supplement summary description is consistent with the staff's analysis for the TLAA on PTS described in Section 4.2.3.2 of this SER. The FSAR Supplement summary description identifies the applicable PTS requirements that the applicant must meet to ensure continued compliance with 10 CFR 50.61. The FSAR Supplement also discusses why the RV beltline materials at FNP, Units 1 and 2, will comply with the applicable requirements in 10 CFR 50.61, as projected through the expiration of the extended period of operation for the units. However, the staff determined that the limiting RT_{PTS} value cited by the applicant for FNP, Unit 2, in the FSAR Supplement summary description (i.e., 193 °F) was not consistent with the limiting RT_{PTS} value cited by the applicant in Table 4.2.3-2 of the application (i.e., 208 °F, based on Intermediate Shell Plant B7212-1) and informed the applicant that this should be corrected appropriately. The staff identified this request as RAI 4.2.3.3-1.

In its response to RAI 4.2.3.3-1, in SNC Letter No. NL-04-0617, dated April 16, 2004, the applicant revised the FSAR Supplement summary description for the PTS assessments to make the applicant's reported limiting RT_{PTS} value consistent with those values included in Table 4.2.3 of the LRA and confirmed independently by the staff using the Reactor Vessel Integrity Database (RVID). The revised limiting RT_{PTS} values cited by the applicant for FNP, Units 1 and 2, in the FSAR Supplement summary description are 191 °F for Unit 1 and 239 °F for Unit 2. These limiting RT_{PTS} values conform to or bound the RT_{PTS} values cited by the applicant in Table 4.2.3 of the application. Because the RT_{PTS} values in the FSAR Supplement summary description provide conservative values relative to the PTS screening criteria, they are acceptable. On the basis of the applicant's response to RAI 4.2.3.3-1, the staff concludes that the applicant's FSAR Supplement summary description for the TLAA on PTS is acceptable and RAI 4.2.3.3-1 is resolved.

As noted previously, the staff performed an independent PTS assessment for FNP, Unit 1, using the revised surveillance capsule data for the unit reported in WCAP-16221-NP, and determined that the revised surveillance data resulted in a slight increase to the limiting RT_{PTS} value for FNP Unit 1 (i.e., a revised RT_{PTS} value of 195 °F). Since this is not a significant change in the previous limiting RT_{PTS} value reported in the FSAR Supplement for the FNP Unit 1 PTS assessment, the staff concludes that the applicant will not need to update the revised RT_{PTS} value listed in the FSAR Supplement for Unit 1 at this time, and instead may use the 10 CFR 50.59 process to update the value once the FSAR Supplements are incorporated in the FSAR for the units following approval of the renewed license.

4.2.3.4 Conclusion

The staff has reviewed the applicant's TLAA on PTS, as summarized in Section 4.2.3 of the LRA, and has determined that the RV beltline materials at FNP Units 1 and 2, will continue to comply with the requirements for PTS outlined in 10 CFR 50.61 throughout the extended period of operation. The staff therefore concludes that the applicant's TLAA for PTS complies with the staff's acceptance criterion for TLAAs found in 10 CFR 54.21(c)(1)(ii), and that the safety margins established and maintained during the current operating term will be maintained during the extended period of operation, as required by 10 CFR 54.21(c)(1). The staff also concludes that the FSAR Supplement contains an appropriate summary description of the TLAA on PTS for the extended period of operation, as required by 10 CFR 54.21(d).

4.2.4 Adjusted Reference Temperature

4.2.4.1 Summary of Technical Information in the Application

In Section 4.2.4 of the LRA, the applicant stated that the calculations it used to determine the adjusted reference temperature (ART) for the critical components of the RV meet the definition of a TLAA pursuant to the criteria of 10 CFR 54.3. The applicant updated these calculations for 54 EFPYs in accordance with 10 CFR 54.21(c)(1)(ii).

The applicant concluded the most limiting material and location for the ART for Unit 1 is the Lower Shell Plate B6919-1, with an ART at 1/4T of 182 °F. For Unit 2, the most limiting material is the Intermediate Shell Plate B7212-1, with an ART at 1/4T of 195 °F. The applicant stated that the Unit 2 ART is based upon RG 1.99, Revision 2, Position 2.1, using credible surveillance capsule data.

4.2.4.2 Staff Evaluation

1/4T RT_{NDT} values for RV beltline materials are used as part of the inputs to the P-T limit curve calculations for operating reactors. The ARTs for beltline materials at the 3/4 thickness location of the RV (i.e., 3/4T RT_{NDT} values) are also used in the calculation of P-T limit curves.

The staff performed independent calculations of the 1/4T and 3/4T RT_{NDT} values for the RV beltline materials at FNP, Units 1 and 2, through 54 EFPYs. The staff based its independent calculations on the methods described in RG 1.99, Revision 2. The staff also applied the neutron fluence values for the 1/4T and 3/4T locations of the FNP RVs, as listed in Table 4.1.2 of the LRA for 54 EFPYs of power operation, for its independent calculations of the 1/4T and 3/4T RT_{NDT} values.

For FNP, Unit 1, the staff calculated a limiting 1/4T RT_{NDT} value of 185.1 °F and a limiting 3/4T RT_{NDT} value of 161.2 °F for Lower Shell Plate C6919-1 (Heat No. C6940-1), using the revised surveillance data reported in WCAP-16221-NP. The staff determined the revised data that were not deemed credible, in accordance with the credibility criteria of RG 1.99, Revision 2, and applied a full margin term to its independent calculations. In contrast to the limiting 1/4T value calculated by the staff, the applicant calculated a limiting 1/4T RT_{NDT} value of 182 °F for FNP, Unit 1. The limiting 1/4T RT_{NDT} value for FNP, Unit 1, calculated by the applicant is within 3 °F of the value calculated by the staff using the revised surveillance data. The staff finds this small difference in the 1/4T RT_{NDT} values to be acceptable, and that it will not significantly impact the 54-EFPY P-T limits for the FNP, Unit 1, RV.

For FNP, Unit 2, the staff calculated limiting 1/4T and 3/4T RT_{NDT} values of 195.8 °F and 162.9 °F for Intermediate Shell Plate B7212-1 (Heat No. C7466-1), based on credible surveillance data and the application of Position 2.1 of RG 1.99, Revision 2. The applicant also calculated a limiting 1/4T RT_{NDT} value of 195 °F for FNP, Unit 2, using credible surveillance data for Intermediate Shell Plate B7212-1 (Heat No. C7466-1). Since the applicant's limiting 54-EFPY 1/4T RT_{NDT} value for FNP, Unit 2, is consistent with that calculated by the staff, the staff finds the limiting 54-EFPY 1/4T RT_{NDT} value for FNP, Unit 2, to be acceptable.

The limiting 1/4T and 3/4T RT_{NDT} values for RV beltline materials in operating reactors are used in the calculations of P-T limits that are required to be calculated under the requirements of Section IV.A.2 to 10 CFR Part 50, Appendix G. The staff determined that the applicant did not provide the 3/4T RT_{NDT} values for the limiting 3/4T beltline materials in this TLAA. The staff requested that the applicant provide its calculations of the limiting 3/4T RT_{NDT} values for the RV beltline materials at FNP, Units 1 and 2, through 54 EFPYs. The staff identified this request as RAI 4.2.4.2-1.

In its response to RAI 4.2.4.2-1, via letter dated April 16, 2004 (SNC Letter No. NL-04-0617), the applicant indicated that the limiting 3/4T RT_{NDT} values for the FNP units are 159 °F for Unit 1 and 163 °F for Unit 2 through 54 EFPYs. In comparison, the staff calculated the limiting 3/4T RT_{NDT} values to be 161.2 °F for Unit 1 and 162.9 °F for Unit 2 through 54 EFPYs. The limiting 3/4T RT_{NDT} values calculated by the applicant are within 3 °F of the values calculated by the staff and are therefore in good agreement. These small differences in the 3/4T RT_{NDT} values will not impact the 54-EFPY P-T limits for the RVs. The staff therefore concludes that the limiting 3/4T RT_{NDT} values provided in the applicant's response to RAI 4.2.4.2-1 are acceptable. Based on this assessment, the staff concludes that the applicant has calculated acceptable limiting 1/4T and 3/4T RT_{NDT} values for the RV beltline materials at FNP, Units 1 and 2, and concludes that the applicant's TLAA for the ART calculations is acceptable.

4.2.4.3 FSAR Supplement

The applicant did not include an FSAR Supplement summary description for its TLAA on the calculation of the ART values (RT_{NDT} values) for the RV beltline materials at the 1/4T and 3/4T locations of the FNP RVs. Since the applicant has defined these ART calculations as TLAAs in Section 4.2.4 of the LRA, the staff informed the applicant that 10 CFR 54.21(d) requires the applicant to include an FSAR Supplement summary description for the TLAA on the calculation of the limiting 1/4T and 3/4T ART values (i.e., limiting 1/4T and 3/4T RT_{NDT} values) through 54 EFPYs of operation. The staff identified this as RAI 4.2.4.3-1.

In its response to RAI 4.2.4.3-1, in SNC Letter No. NL-04-0617, dated April 16, 2004, the applicant indicated that the FSAR Supplement would be amended to include the following summary description for the TLAA on the 1/4T and 3/4T RT_{NDT} calculations:

> SNC updated the calculations to determine the adjusted reference temperature (ART) for critical components of the reactor vessel for 54 EFPY in accordance with 10 CFR 54.21(c)(1)(ii). The ART values that apply to the current operating conditions at FNP are included in the Pressure Temperature Limits Report (PTLR) for each unit. When the PTLR is updated to include P-T limit curves that bound the current level of neutron embrittlement for the unit, the updated ART values are included.

The staff approved the FNP PTLR on March 31, 1998. Section 4.2.1.3 of this SER describes the PTLR process and includes NRC-approved methods for calculating the 1/4T and 3/4T RT_{NDT} values for FNP, Units 1 and 2. Since the applicant provided acceptable 54 EFPY 3/4T RT_{NDT} values for the FNP units in response to RAI 4.2.4.2-1 and because the PTLR process has been approved by the staff, the staff concludes that the proposed summary description provides an acceptable basis on how the 54-EFPY 1/4T and 3/4T RT_{NDT} values will be applied to the P-T limit calculations. Based on this assessment, the staff concludes that the FSAR Supplement summary description for the TLAA on the ART calculations is acceptable. RAI 4.2.4.3-1 is resolved.

4.2.4.4 Conclusion

The staff has reviewed the applicant's TLAA on the calculation of 1/4T and 3/4T ARTs, as summarized in Section 4.2.4 of the LRA. The staff has also determined that the applicant's calculation of the 1/4T and 3/4T RT_{NDT} values for the RV beltline materials, as projected through the period of extended operation for FNP, Units 1 and 2, complies with the recommended guidelines of RG 1.99, Revision 2. The staff therefore concludes that the applicant's TLAA for calculation of the 1/4T and 3/4T ARTs complies with the staff's acceptance criterion for TLAAs described in 10 CFR 54.21(c)(1)(ii), and that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation, as required by 10 CFR 54.21(c)(1). The staff also concludes that the FSAR Supplement contains an appropriate summary description of the TLAA on ART calculations for the period of operation, as required by 10 CFR 54.21(d).

4.2.5 Pressure-Temperature (P-T) Limits

4.2.5.1 Summary of Technical Information in the Application

In Section 4.2.5 of the LRA, the applicant addressed Appendix G to 10 CFR Part 50, which requires that heat up and cool down of the reactor pressure vessel (RPV) be accomplished within established P-T limits. Plant-specific calculations establish these limits. The calculations utilize materials and fluence data obtained through plant-specific reactor surveillance capsule programs.

The applicant includes the P-T limit curves for the current operating conditions in the PLTR for each unit. When the operating conditions of each unit merit the use of a different curve, the applicant updates the PTLR for that unit to include P-T limit curves that bound the current level of neutron embrittlement for the unit. The applicant may further update the P-T limit curves based upon data gained from capsules that the applicant receives in accordance with the Reactor Vessel Surveillance Program.

4.2.5.2 Staff Evaluation

Paragraph IV.A.2 of 10 CFR Part 50, Appendix G, provides the criteria for generating the P-T limits that are required for commercial U.S. light-water reactors. As required by 10 CFR 50.36, licensees owning nuclear power production facilities must include the P-T limits and LTOP setpoints among the limiting conditions for operation (LCOs) in the plant TS. However, on August 31, 1996, the staff issued Generic Letter (GL) 96-03, "Relocation of the Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits," and provided an acceptable process for revising the LCOs for plant-specific P-T limits and LTOP setpoints for relocating the actual P-T limit curves and LTOP setpoints out of the LCOs and into a PTLR. The GL also required that the PTLR be administratively controlled by the Administrative Controls Section of the TS.

The applicant requested staff approval of a PTLR for FNP, Units 1 and 2, in a license amendment request dated December 18, 1997. The staff approved the PTLR for FNP, Units 1 and 2, in its safety evaluation dated March 31, 1998. The FNP PTLR process generates the FNP P-T limits in accordance with the NRC-approved methodology in WCAP-14040-NP-A, Revision 2. This approach includes a methodology for calculating the ARTs for the 1/4T and 3/4T locations of the RV, in accordance with the guidelines of RG 1.99, Revision 2, and for generating the P-T limit curves, in conformance with the requirements of Section IV.A.2 of 10 CFR Part 50, Appendix G, and Appendix G to Section XI of the ASME Boiler and Pressure Vessel Code.

The staff's approval of the PTLR in its safety evaluation of March 31, 1998, permits the applicant to generate the P-T limit curves for the extended period of operation for FNP, Units 1 and 2, without the need for a license amendment for the curves. FNP TS 5.6.6.c requires the applicant to submit the PTLR to the staff for "docketing" purposes only when a new fluence period occurs for the units or when it revises or supplements the PTLR. On the basis of this review, and the NRC's acceptance that the 54-EFPY P-T limit curves may be processed through SNC's PTLR process for the FNP RVs, the staff concludes that the applicant's TLAA for the FNP P-T limits is acceptable.

4.2.5.3 FSAR Supplement

Section A.4.1.3 of the LRA includes the following FSAR Supplement summary description for the TLAA on the FNP P-T limits:

> Appendix G of 10 CFR Part 50 requires heat-up and cool-down of the reactor pressure be accomplished within established limits for P-T. Plant specific calculations establish these limits. The calculations utilize materials and fluence data obtained through plant specific reactor surveillance capsule programs.
>
> The P-T limit curves that apply for the current operating conditions at FNP are included in the Pressure Temperature Limits Report (PTLR) for each unit. When the operating conditions of each

unit merit the use of a different curve, the PTLR for that unit is updated to include P-T limit curves that bound the current level of embrittlement for the unit. SNC has updated the FNP P-T calculations, including the adjusted reference temperature (ART) values, to account for 54 EFPY in accordance with 10 CFR 54.21(c)(1)(ii).

The applicant's FSAR Supplement summary description for the TLAA on the P-T limits appropriately describes the NRC-approved PTLR process, which was approved in the staff's safety evaluation of March 31, 1998, as the basis for revising the P-T limits for the extended period of operation for the FNP units. The staff concludes that the FSAR Supplement summary description adequately describes the TLAA on the P-T limits and is therefore acceptable.

4.2.5.4 Conclusion

The staff has reviewed the applicant's TLAA on P-T limits, as summarized in Section 4.2.5 of the LRA, and has determined that the applicant will generate the P-T limits for the extended period of operation for FNP, Units 1 and 2, in accordance with the FNP PTLR. The staff therefore concludes that the applicant's TLAA for the FNP P-T limits will comply with the acceptance criterion for TLAAs described in 10 CFR 54.21(c)(1)(ii) when the applicant generates P-T limits for the period of extended operation and incorporates them into the FNP PTLR. Further, the staff concludes that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation, as required by 10 CFR 54.21(c)(1). The staff also concludes that the FSAR Supplement contains an appropriate summary description of the TLAA on P-T limits for the period of operation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

4.3.1 Fatigue of ASME Class 1 Components

A metal component subjected to cyclic loading at loads less than the static design load may fail due to fatigue. The applicant may have evaluated potential metal fatigue of components on the basis of an assumed number of transients or cycles for the current operating term. The staff reviewed the validity of such metal fatigue analysis for the period of extended operation.

4.3.1.1 Summary of Technical Information in the Application

The applicant discussed the design of the FNP reactor coolant pressure boundary (RCPB) components in Section 4.3.1 of the LRA. Components of the RCPB were designed to the ASME Boiler and Pressure Vessel Code, Section III, requirements for Class 1 components. Table 4.3.1, "Class 1 Thermal Fatigue Cycles," of the LRA lists the FNP FSAR transients and number of transient cycles used in the design of ASME Class 1 components. Table 4.3.1 also lists the estimated number of transient cycles for 60 years of plant operation for each unit. The applicant's estimate indicates that the number of design cycles will remain bounding for the period of extended operation. In addition to the design of ASME Class 1 components using the transient cycles listed in Table 4.3.1 of the LRA, the applicant identified evaluations that it performed to address other specific issues. The applicant performed evaluations for the surge line to address NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification," and the residual heat removal (RHR) suction lines to address NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems." The applicant indicated that these lines will be monitored by the FNP Fatigue Monitoring Program (FMP). Section B.5.7 of the LRA describes the FMP.

The applicant discussed the evaluation of environmentally assisted fatigue of RCPB components. The applicant provided the results of an evaluation of the environmental effects on the components listed in NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” dated March 1995. The applicant also used the environmental fatigue correlations in NUREG/CR-6583, “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low Alloy Steels,” dated March 1998, and NUREG/CR-5704, “Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels,” dated April 1999, in the evaluations.

4.3.1.2 Staff Evaluation

As discussed previously, components of the FNP RCPB were designed to the Class 1 requirements of the ASME Code. These requirements contain explicit criteria for the fatigue analysis of components. Consequently, the applicant identified the fatigue analysis of these components as TLAAs. The staff reviewed the applicant’s evaluation of the RCPB components for compliance with the provisions of 10 CFR 54.21(c)(1).

The specific design criterion for fatigue analysis of RCPB components involves calculating the cumulative usage factor (CUF). The fatigue damage in the component caused by each thermal or pressure transient depends on the magnitude of the stresses caused by the transient. The CUF sums the fatigue damage resulting from each transient. The design criterion requires that the CUF not exceed 1.0. The applicant indicated that the FMP monitors the design transients at FNP, Units 1 and 2. Table 4.3.1 of the LRA provides the current cycle counts and estimated cycle counts at 60 years of plant operation for significant transients used in the design of ASME Class 1 components. Note 5 of Table 4.3.1 indicates that the applicant did not count step-load change transients before the installation of fatigue monitoring software, and that the number of these prior transients would be estimated using the current fatigue monitoring software. In RAI 4.3.1-1, the staff requested that the applicant describe the method that will be used to estimate the number of transient cycles that occurred before the installation of the fatigue monitoring software. The staff also requested that the applicant provide a list of the transients that will be monitored by the FMP.

In its response to RAI 4.3.1-1, dated February 20, 2004, the applicant described the method that SNC will use to estimate the number of step-load change transients that occurred before the installation of the fatigue monitoring software. The applicant indicated that the estimate of step-load transients will be based on the rate determined from five years of fatigue monitoring data, adjusted by a weighting factor derived from a comparison of the number of previous plant trips to the number of plant trips during the five year monitoring period. The applicant also indicated that, because load-follow operation is not used at FNP, Units 1 and 2, it expects the number of step-load changes to be a small fraction of the number for design. The staff finds the applicant’s proposed method to estimate previous step transients reasonable and acceptable.

The applicant also provided a list of the transients monitored by the FMP. The staff compared the list of monitored transients with those listed in FNP FSAR Table 5.2-2. The applicant monitors all of the normal, upset, and test transients listed in FSAR Table 5.2-2, except for unit loading and unloading at 5 percent of full power/minute. The applicant indicated that this transient was intended to account for plant load-follow operation. As discussed above, the applicant indicated that it does not use load-follow operation at FNP, Units 1 and 2. The staff considers the number of transients listed in the FNP FSAR for these load changes conservative, based on the information presented in NUREG/CR-6260. Therefore, the staff agrees with the applicant that it is not necessary to track these transients. On the basis of the information provided by the applicant, the staff finds that the FMP tracks the significant design transients listed in Table 5.2-2 of the FNP FSAR.

The Westinghouse Owners Group (WOG) issued WCAP-14577, Revision 1-A, "Aging Management for Reactor Internals," in March 2001 to address the aging management of the reactor vessel internals (RVI). Section 2.3.1 of the LRA indicates that the applicant reviewed WCAP-14577, Revision 1-A, as a source of input information for FNP. The staff's review of WCAP-14577, Revision 1-A, identified a number of issues that should be addressed on a plant-specific basis. Renewal Applicant Action Item 11 specified in WCAP-14577, Revision 1-A, indicates that the fatigue TLAA of the RVI should be addressed on a plant-specific basis. In RAI 4.3.1-2, the staff requested that the applicant discuss the design basis for the components listed in Table 3-3 of WCAP-14577, Revision 1-A, and indicate how fatigue of these components is managed.

In its response to RAI 4.3.1-2, dated February 20, 2004, the applicant indicated that it had evaluated the FNP RVI according to Westinghouse internal criteria, which are similar to the ASME Code criteria. The applicant further indicated that the transient cycles used in the evaluation of the FNP RVI are bounded by those monitored by the FMP. The applicant estimated that the number of transient cycles assumed in the design of the FNP RVI will not be exceeded during the period of extended operation. Additionally, the applicant's FMP will track the number of design transient cycles during the period of extended operation. The staff finds that the applicant has adequately addressed Renewal Applicant Action Item 11 specified in WCAP-14577, Revision 1-A, by assuring that the FMP will monitor the design transients that are significant contributors to design fatigue usage of the RVI components.

The WOG issued WCAP-14575-A, "Aging Management Evaluation for Class 1 Piping and Associated Pressure Boundary Components," in August 1996 to address aging management of the reactor coolant system (RCS) piping. Section 2.3.1 of the LRA indicates that WCAP-14575-A, was reviewed as a source of input information for FNP. Tables 3-2 through 3-16 of WCAP-14575-A list RCS components for which fatigue is considered significant. The staff's review of WCAP-14575-A identified a number of issues that should be addressed on a plant-specific basis. Renewal Applicant Action Item 8 indicates that the applicant should address components labeled I-M and I-RA in Tables 3-2 through 3-16 of WCAP-14575-A. The applicant's FMP monitors the significant plant design transients listed in FSAR Table 5.2-2 that were used in the design of the RCPB components. The staff finds that the applicant's FMP, which monitors the significant plant design transients, adequately addresses Renewal Applicant Action Item 8.

The WOG issued WCAP-14574-A, "License Renewal Application: Aging Management Evaluation for Pressurizers," in December 2000 to address aging management of pressurizers. Section 2.3.1 of the LRA indicates that the applicant reviewed WCAP-14574-A as a source of input information for FNP. The staff's review of WCAP-14574-A identified a number of issues that should be addressed on a plant-specific basis. Renewal Applicant Action Item 1 requests the applicant to demonstrate that the pressurizer subcomponent CUFs remain below 1.0 for the period of extended operation. Table 2-10 of WCAP-14574-A indicates that the ASME Section

III, Class 1 fatigue CUF criterion could be exceeded at several pressurizer subcomponent locations during the period of extended operation. WCAP-14574-A also identified recent unanticipated transients that were not considered in the original ASME Section III, Class 1 fatigue analyses, including inflow/outflow thermal transients. In RAI 4.3.1-3, the staff requested the applicant to provide the following information:

- confirmation that the additional transients discussed in WCAP-14574-A that were not considered in the original design have been addressed at FNP

- details on the ASME Section III, Class 1 CLB CUFs for the applicable subcomponents of the FNP pressurizers specified in Table 2-10 of WCAP-14574-A and the corresponding CUFs for the extended period of operation

- the impact of the environmental fatigue correlations provided in NUREG/CR- 6583 and NUREG/CR-5704 on the above results

In its response to RAI 4.3.1-3, dated February 20, 2004, the applicant indicated that the FMP stress-based monitoring of the surge line and pressurizer lower head accounts for the additional transients discussed in WCAP-14574-A. The applicant also indicated that all FNP pressurizer subcomponents have design CUFs equal to or less than those shown in Table 2-10 of WCAP-14574-A. The applicant indicated that the number of cycles assumed in the design of these subcomponents exceeds the number expected for 60 years of plant operation, and therefore, the analyses remain valid for the period of extended operation.

As discussed in Section 4.3.1 of this SER, the applicant performed an additional evaluation of the pressurizer surge line in response to NRC Bulletin 88-11. The applicant's evaluation indicated that the usage factor, including environmental effects, will remain less than 1.0 for 60 years of plant operation for the surge line and pressurizer lower head. The applicant further indicated that stress-based fatigue monitoring of the surge line and lower pressurizer will be used to ensure that the fatigue usage of these components remains less than 1.0. The staff finds that the applicant has adequately addressed Renewal Applicant Action Item 1 of WCAP-14574-A by (1) evaluating the fatigue sensitive subcomponents for insurge/outsurge transients, (2) considering the effects of the reactor water environment, and (3) assuring that the FMP will monitor the thermal transients that are significant contributors to the design fatigue usage of RCS components.

The applicant also performed additional evaluation of the FNP RHR suction lines in response to NRC Bulletin 88-08. The applicant committed to use the FMP to monitor the RHR suction line transients to ensure that the number of transients used in the evaluation is not exceeded during the period of extended operation. The staff finds that the applicant's FMP provides an acceptable program to monitor the RHR suction line fatigue usage during the period of extended operation, in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

The applicant indicated that the FMP will continue during the period of extended operation and will assure that design cycle limits are not exceeded. The applicant's FMP tracks transients and cycles of RCS components that have explicit design transient cycles to assure that these components remain within their design basis. Generic Safety Issue (GSI)-166, "Adequacy of the Fatigue Life of Metal Components," raised concerns regarding the conservatism of the fatigue curves used in the design of the RCS components. Although GSI-166 was resolved for the current 40-year design life of operating components, the staff identified GSI-190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life," to address license renewal. The NRC closed GSI-190 in December 1999, concluding the following:

> The results of the probabilistic analyses, along with the sensitivity studies performed, the iterations with industry (NEI and EPRI), and the different approaches available to the licensees to manage the effects of aging, lead to the conclusion that no generic regulatory action is required, and that GSI-190 is closed. This conclusion is based primarily on the negligible calculated increases in core damage frequency in going from 40 to 60 year lives. However, the calculations supporting resolution of this issue, which included consideration of environmental effects, and the nature of age-related degradation indicate the potential for an increase in the frequency of pipe leaks as plants continue to operate. Thus, the staff concludes that, consistent with existing requirements in 10 CFR 54.21, licensees should address the effects of coolant environment on component fatigue life as aging management programs are formulated in support of license renewal.

The applicant indicated that it evaluated six component locations equivalent to those identified in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," dated February 1995, for a newer vintage Westinghouse plant. The staff notes that FNP consists of three-loop Westinghouse plants, whereas the newer vintage plant in NUREG/CR-6260 is a four-loop Westinghouse plant. Consequently, some of the component locations were not directly comparable. The applicant selected an alternative location for the safety injection nozzle. NUREG/CR-6260 evaluated the boron injection line cold-leg nozzle. At FNP, Units 1 and 2, the boron injection line connects to the residual heat removal/safety injection (RHR/SI) line. Therefore, the applicant selected the boron injection line tee connection to the RHR/SI line. The applicant also evaluated the RHR/SI RCS cold-leg nozzle. The staff finds these locations to be acceptable for evaluating environmental fatigue.

The staff compared the applicant's calculated fatigue usage factors with those listed in NUREG/CR-6260. The applicant's calculated fatigue usage factors were comparable to those in NUREG/CR-6260 for the RV shell, inlet/outlet nozzles, and charging nozzle. Since the applicant used the boron injection tee connection to the RHR/SI line, a comparable NUREG/CR-6260 location does not exist. However, the applicant's calculated usage factor for the RHR/SI RCS cold-leg nozzle is comparable to the SI nozzle usage factor listed in NUREG/CR-6260. The applicant's calculated usage factor for the surge line hot-leg nozzle is much lower than the value listed in NUREG/CR-6260 because the applicant uses stress-based fatigue monitoring at that location.

The calculated fatigue usage factors for the vessel and inlet/outlet nozzles were below 1.0 for both units. The staff finds these results acceptable, on the basis of their comparison to the results presented in NUREG/CR-6260 for a newer vintage Westinghouse plant. The applicant's evaluation of the boron injection tee connection to the RHR/SI line indicated that the usage factor for both units was well below the allowable limit of 1.0. The staff finds this result acceptable, on the basis of the low design fatigue usage factors reported by the applicant at these locations. The applicant indicated that the fatigue usage for the FNP surge line hot-leg nozzles is not expected to exceed 1.0 during the period of extended operation. The applicant's assessment was based on a projection of the average fatigue usage obtained for six Unit 1 cooldown/heatup cycles and four Unit 2 cooldown/heatup cycles obtained from the stress-based fatigue monitoring software. In RAI 4.3.1-4, the staff requested the applicant to describe the stress-based fatigue monitoring of the surge line hot-leg nozzle. The staff also requested that the applicant indicate whether there were any changes in the plant operations since the startup of Units 1 and 2 that could affect the fatigue usage of the surge line hot-leg nozzle.

In its response to RAI 4.3.1-4, dated February 20, 2004, the applicant discussed the FNP stress-based monitoring of the surge line and pressurizer lower head. The applicant indicated that FNP uses the modified steam bubble method during heat up to mitigate the effects of insurge/outsurge transients. The applicant indicated that the current method of operation was established early in the plant life. In order to account for operation prior to the establishment of the current procedure, the applicant applied a factor of 1.5 to the measured stress-based CUF. The staff finds the applicant's procedure to be a reasonable method of estimating the fatigue usage prior to the establishment of the current method of operation.

The applicant's evaluation indicated that the calculated usage factors may exceed 1.0 for two components, the charging nozzle and the RHR/SI nozzle to the RCS cold leg. The applicant committed to take corrective actions before the period of extended operation to address these components. The corrective actions would include one or more of the following four options:

- further refinement of the fatigue analyses

- repair of the affected locations

- replacement of the affected locations

- management of the effects of fatigue through the use of an augmented, NRC-approved inservice inspection program

In order to pursue the fourth option, the applicant must use an NRC-approved inspection plan to obtain NRC approval of its proposed inservice inspection program to manage fatigue prior to the period of extended operation by submitting a license amendment request. After the NRC approval of the inspection program, any future changes to the inspection program will be evaluated in accordance with the 10 CFR 50.59 process. The staff finds the applicant's proposed options provide acceptable plant-specific approaches to address the charging nozzle and the RHR/SI nozzle for the period of extended operation, in accordance with 10 CFR 54.21(c)(1).

4.3.1.3 FSAR Supplement

The applicant provided an FSAR Supplement summary description of the FMP in Section A.3.2 of the LRA, and a description of its TLAA evaluation for ASME Section III, Class 1 component fatigue analysis in Section A.4.2.1 of the LRA. On the basis of its review of the FSAR Supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of ASME Section III, Class 1 components is adequate.

4.3.1.4 Conclusion

The staff has reviewed the applicant's metal fatigue TLAA and concludes that the applicant's actions and commitments satisfy the requirements of 10 CFR 54.21(c)(1). The staff has also reviewed the FSAR Supplement for the TLAA and finds its description of the metal fatigue TLAA for ASME Section III, Class 1 components sufficient to satisfy 10 CFR 54.21(d).

4.3.2 Fatigue of the Reactor Coolant Pump Flywheel

As required by 10 CFR 54.21, applicants for license renewal must manage time-dependent aging effects by one of three acceptable methods:

(1) demonstration that the time-limited aging analysis on the aging effect for the current operation term remains valid for the period of extended operation

(2) demonstration that the time-limited aging analysis on the aging effect for the current operation term has been projected to the end of the period of extended operation

(3) demonstration that the effect of aging on the intended functions will be adequately managed for the period of extended operation

The reactor coolant pump (RCP) flywheels in PWR-type light-water reactors are designed with rotors and discs that revolve at high speeds. The high-speed cycling of the rotors and discs can make the components susceptible to crack initiation and growth by fatigue, which is a time-dependent aging mechanism. The regions of the flywheels that are most susceptible to low-cycle fatigue are located at the corners of the locking mechanisms in the flywheel rotors and discs. These corners act as stress risers, which make the corners more highly susceptible to the initiation and growth of fatigue-indued cracking. Applicants owning plants that include RCP flywheels in the plant designs must therefore demonstrate that initiation and growth of a crack in the RCP flywheel rotors and discs will be adequately managed in accordance with one of the three acceptable methods designated by the staff in 10 CFR 54.21(c)(1).

4.3.2.1 Summary of Technical Information in the Application

The applicant stated that the design of the flywheels for the RCPs at FNP assumes that the pump will be subjected to 4000 start/stop cycles, and that the calculations that prove the design envelop the life of the component. The applicant stated that SNC conservatively elects to treat these calculations as TLAAs, and that the assumption of 4000 start/stop cycles is conservative for 60 years of operation. The applicant stated that the existing calculations are therefore adequate and do not require updating for license renewal (i.e., they do no require demonstration, in accordance with 10 CFR 54.41(c)(1)(i)).

Section 5.2.6 of the FNP FSAR provides a discussion of the design basis for the RCP flywheels, and Figure 5.2-11 of the FNP FSAR illustrates the design basis for their material properties and minimum fracture toughness properties.

4.3.2.2 Staff Evaluation

RG 1.14, Revision 1, “Reactor Coolant Pump Flywheel Integrity,” issued August 1975, provides the staff’s recommended acceptance criteria for material and minimum fracture toughness properties of SA 508, Class 2 and 3 materials, and SA 533 Grade B, Class 2 materials used in the fabrication of U.S. RCP flywheels. RG 1.14, Revision 1, also provides acceptable guidelines for performing the structural integrity assessments for the RCP flywheels in U.S. light-water reactors, including the assessments for ensuring the integrity of the flywheels against unacceptable fatigue-induced crack growth failures. These fatigue assessments are based on fatigue-induced crack growth associated with the number of start/stop cycles assumed in the design basis for the pumps. Therefore, to meet the acceptance criterion of 10 CFR 54.21(c)(1)(i), the applicant must demonstrate that the total number of RCP start/stop cycles projected through the end of the extended period of operation for each of the FNP units will be bounded by the number of RCP start/stop cycles assumed in the 60-year, fatigue-induced crack growth analysis for the FNP RCP flywheels (i.e., based on a bounding analysis of 6000 RCP start/stop cycles).

In RAI 4.0-1, the staff requested the applicant to clarify whether the number of RCP start/stop cycles assumed in the 60-year RCP flywheel crack growth analysis was based on 4000 start/stop cycles or 6000 start/stop cycles. The applicant responded to RAI 4.0-1 in SNC Letter No. NL-04-0617, dated April 16, 2004. The applicant clarified that it assumed 6000 RCP start/stop cycles in its 60-year analysis. The staff concludes that the applicant’s response to RAI 4.0-1 is acceptable because it clarifies the number of RCP start/stop cycles the applicant assumed in its 60-year RCP flywheel crack growth analysis. On the basis of the applicant’s response to RAI 4.0-1, the staff concludes that RAI 4.0-1 is resolved.

In its application, the applicant concluded that the results of the TLAA for the RCP flywheels at FNP, Units 1 and 2 (i.e., the TLAA assessment in the CLB), remain valid for the extended period of operation for the units and therefore meets the acceptance criterion in 10 CFR 54.21(c)(1)(i). By letter dated December 5, 2003, SNC provided the following supplement to the TLAA description for the RCP flywheels (LRA Section 4.3.2):

> For FNP, WCAP-15666 and WCAP-14535A bound the issue of cracking of the reactor coolant pump flywheel. For both analyses, the fatigue crack growth evaluation is performed in accordance with the ASME Code, Section XI requirements. These analyses show that, for a bounding set of flywheels, the fatigue crack growth is negligible. In the WCAPs, the FNP flywheels were included in Group 5. Group 5 is bounded by Groups 1 and 2 for the purposes of the evaluation. The results of the evaluation are a crack growth of approximately 0.08 inches in the bounding Groups, assuming 6000 start and stop cycles in a 60 year operating life.
>
> For FNP, the number of reactor coolant pump start and stop cycles is anticipated to be significantly less than 6000, even considering the extended license term. The number of reactor shutdowns is anticipated to be less than 200 (reference LRA, Section 4.3.1) and that would mean exceeding 30 start/stop cycles of the reactor coolant pumps per shutdown. FNP uses vacuum refill from a shutdown condition, which means that the RCPs are stopped and re-started once per shutdown under normal conditions. Given that the fatigue crack growth is not significant, and the number of start/stop cycles anticipated is so much less than assumed in the evaluation, SNC has concluded that the fatigue growth analysis is not significant to the aging of the reactor coolant pump flywheel. However, SNC conservatively elects to call this issue a TLAA. It is further significant to note that FNP has Technical Specification requirements to inspect the flywheels in accordance with the ISI Plan (TS 5.5.7).

The applicant’s supplemental information indicates that the applicant’s fatigue crack growth analyses assumed the occurrence of 6000 RCP start/stop cycles through the expiration of the extended period of operation for the FNP units and a crack growth of 0.08 inches. The fatigue analyses in LRA Section 4.3 for ASME Code Class 1 components conservatively assume the occurrence of 200 plant startup and trip cycles through 60 years of licensed operation. Based on these assumptions, the supplemental information indicates that it would take over 30 RCP start/stop cycles per plant shutdown to exceed the allowable crack growth of 0.08 inches. The staff concludes that this number of start/stop cycles is beyond the normal number of RCP start/stop cycles that would be expected to occur during any plant shutdown. Based on this assessment, the staff concludes that the RCP flywheels have a sufficient margin against fracture for the period of extended operation for the FNP units, and that the fatigue crack analysis for the RCP flywheels remains valid for the extended period of operation for the FNP units. Based on this assessment, the staff concludes that the TLAA for the RCP flywheels, as described in LRA Section 4.3.2 and supplemented by the information provided in the applicant's letter of April 16, 2004, complies with 10 CFR 54.21(c)(1)(i) and is therefore acceptable.

4.3.2.3 FSAR Supplement

As required by 10 CFR 54.21(d), applicants for license renewal must include an FSAR Supplement summary description of the "programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses for the period of extended operation." On December 5, 2003, the applicant provided the following FSAR Supplement summary description for the TLAA on fatigue-induced crack growth of the FNP RCP flywheels:

> A.4.2.3 Reactor Coolant Pump Flywheel Fatigue
>
> In WCAP-14535A and WCAP-15666, Westinghouse has generically analyzed the potential for cracking due to fatigue in Reactor Coolant Pump (RCP) flywheels. These two Westinghouse analyses are applicable to FNP. The evaluations of the growth of an assumed crack in the flywheel uses the assumption that the RCPs will experience 6000 start/stop cycles over 60 years of operation. The evaluations show that the crack growth is negligible for the flywheel model that bounds those in the RCP at FNP. The number of start/stop cycles for the FNP RCPs is estimated to be significantly less than 6000 through the period of extended operation. Therefore, these analyses are valid for FNP through the period of extended operation (demonstration in accordance with 10 CFR 54.21(c)(1)(i)).

The applicant's FSAR Supplement summary description for the TLAA on the RCP flywheels, as discussed in Section A.4.2.3 of the LRA, provides a reference to WCAP-14535A and WCAP-15666. These documents are applicable to FNP and reflect the information given in Section 4.3.2 of the LRA, as supplemented by the additional information on the flywheel analyses that the applicant provided in its letter of December 5, 2003. Because the FSAR Supplement summary description for the TLAA reflects the applicant's compliance with 10 CFR 54.21(c)(1)(i), the staff concludes that the FSAR Supplement summary description for the RCP flywheels is acceptable and meets the requirements of 10 CFR 54.21(d).

4.3.2.4 Conclusion

The staff has reviewed the applicant's TLAA for fatigue-induced crack growth of the FNP RCP flywheels, as described in Section 4.3.2 of the FNP LRA. The staff has also determined that the current fatigue-induced crack growth assessment for the FNP RCP flywheels remains bounding for the periods of extended operation for FNP Units 1 and 2. The staff therefore concludes that the applicant's TLAA for fatigue-induced crack growth of the RCP flywheels complies with the acceptance criterion for TLAAs found in 10 CFR 54.21(c)(1)(i), and that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation, as required by 10 CFR 54.21(c)(1). The staff also concludes that the FSAR Supplement contains an appropriate summary description of the TLAA on fatigue-induced crack growth of the RCP flywheels for the period of extended operation, as required by 10 CFR 54.21(d).

4.3.3 Fatigue of ASME Non-Class 1 Components

4.3.3.1 Summary of Technical Information in the Application

The applicant discussed the evaluation of ASME Class 2 and 3 and American National Standards Institute (ANSI) B31.1 components in Section 4.3.3 of the LRA. ASME Class 2 and 3 and ANSI B31.1 require that a stress reduction factor be applied to the allowable thermal bending stress range, if the number of full-range cycles exceeds 7000. The applicant indicated that most piping systems within the scope of license renewal are bounded by 7000 thermal cycles. Therefore, the applicant concluded that the existing pipe stress calculations are valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The applicant identified two systems, the sampling system tubing and the air start system for the emergency diesel generators (EDGs), that may experience greater than 7000 cycles. The applicant indicated that the sampling system was designed for 22,000 cycles and that this number of cycles would not be exceeded during the period of extended operation. The applicant also stated that an evaluation of the air start system indicated that the equivalent number of full-temperature cycles is less than 7000. Therefore, the applicant concluded that the piping analyses for these systems will remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.3.3.2 Staff Evaluation

As discussed above, ASME Class 2 and 3 and ANSI B31.1 require that a stress reduction factor be applied to the allowable thermal bending stress range, if the number of full-range cycles exceeds 7000. The applicant indicated that most piping systems within the scope of license renewal are bounded by the 7000 cycles. The applicant also indicated that the sampling system was designed for 22,000 cycles and that this number of cycles would not be exceeded during the period of extended operation. The staff agrees with the applicant’s conclusion that the analyses of these systems remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The applicant indicated that the number of thermal cycles for the EDG air start system may exceed 7000 during the period of extended operation. The applicant also indicated that the equivalent number of full-temperature cycles will be less than 7000 cycles. In RAI 4.3.3-1, the staff requested the applicant to describe the method used to calculate the equivalent number of full-temperature cycles.

In its response to RAI 4.3.3-1, dated February 20, 2004, the applicant described the evaluation of the EDG air start system. The applicant indicated that the FNP air start system actuates several times a day to recharge the air pressure in the receivers which is lost due to normal leakage. The applicant installed temperature-monitoring equipment to measure the temperature downsteam of the compressors over several days of normal operation. The applicant used these data to determine the number and magnitude of the temperature cycles. The measured temperature during each cycle was significantly less than the maximum temperature reached when the air receivers are fully recharged following major EDG maintenance. The applicant used the provisions of the ASME Code, Section III, 1971 Edition, NC-3611.1 to calculate the number of equivalent full-temperature cycles based on the measured temperatures during daily cycling of the compressors. The calculated number of equivalent full-temperature cycles was significantly less than the 7000-cycle limit. The staff finds that the applicant's evaluation satisfies the ASME Code requirement and is therefore acceptable. The staff also finds that the applicant projected the piping analysis of the EDG air start system to the end of the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.3.3 FSAR Supplement

The applicant provided an FSAR Supplement summary description of its TLAA evaluation for ASME non-Class1 components in Section A.4.2.2 of the LRA. On the basis of its review of the FSAR Supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of ASME non-Class 1 components is adequate.

4.3.3.4 Conclusion

The staff has reviewed the applicant's metal fatigue TLAA and concludes the applicant's actions and commitments satisfy the requirements of 10 CFR 54.21(c)(1). The staff has also reviewed the FSAR Supplement for the TLAA and finds that the FSAR Supplement contains a description of the metal fatigue TLAA for ASME Code, Section III, Class 2 and 3 and ANSI B31.1 components sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.3.4 Containment Tendon Prestress

4.3.4.1 Summary of Technical Information in the Application

The applicant stated that to meet the requirements of 10 CFR 50.55a(b)(2)(ix)(B), it uses an analysis to predict the amount of residual prestress in the containment tendons for FNP, Units 1 and 2. The applicant further asserted that the analysis meets the definition of a TLAA, and that it performed a new analysis to estimate the amount of residual prestress in the tendons after 60 years of operation to demonstrate compliance with 10 CFR 54.21(c)(1)(ii). The new calculation includes the latest measurements of containment tendon prestress taken since the plant began commercial operation. The calculation indicates that acceptable containment tendon prestress will continue to exist throughout the period of extended operation. The applicant further stated that it may update this analysis with future results of the anchor pull testing performed in accordance with the IWL Inservice Inspection Program (Appendix B.3.1).

4.3.4.2 Staff Evaluation

The applicant provided a description of the TLAA without providing any quantitative comparison of the present level of the prestressing forces based on the measurements, trend lines, and projected forces during the extended period of operation. In order to understand the basis for its assertion, the staff requested the following in RAI 4.3.4-1:

> 10 CFR 54.21(c)(1)(ii) requires that the applicant demonstrate the adequacy of the analysis projected for the extended period of operation. In order for the staff to make a reasonable assurance conclusion, the applicant is requested to provide the following information:
>
> - Minimum required prestressing forces for each group of tendons,
> - Trend lines of the projected prestressing forces for each group of tendons

based on the regression analysis of the measured prestressing forces (see NRC Information Notice 99-10 for more information).

- Plots showing comparisons of prestressing forces projected to the end of the extended period of operation with the minimum required prestress for each group of tendons.

In its response to RAI 4.3.4-1(a), dated April 16, 2004, the applicant provided the following information:

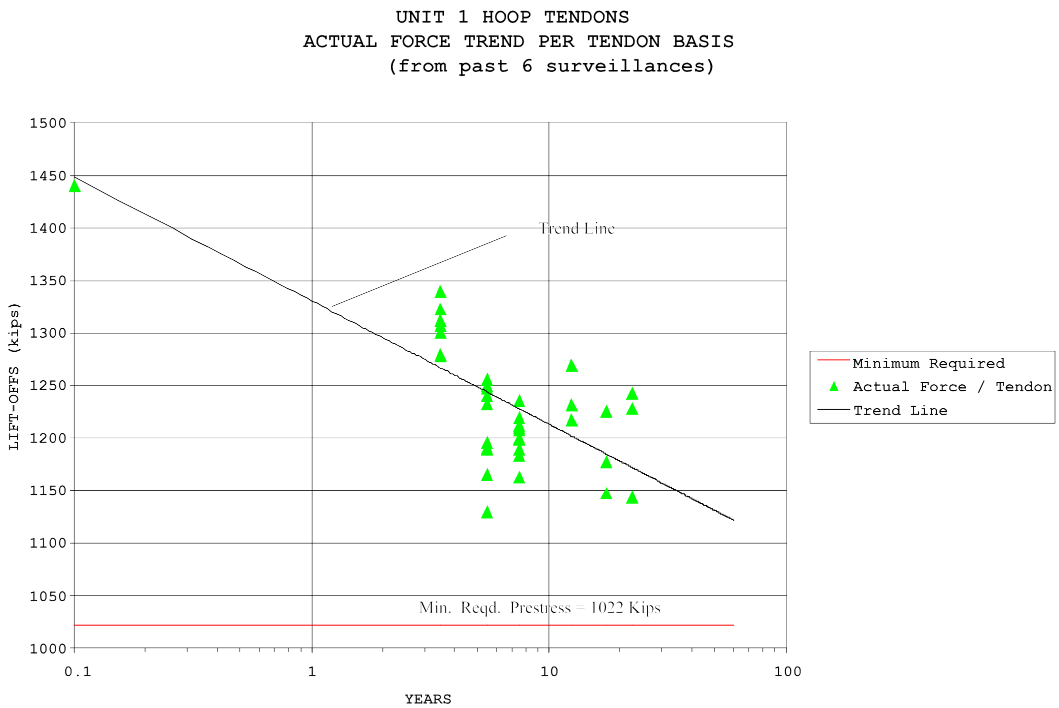
(a) The following are the minimum required prestressing forces per tendon (170 wires/tendon):

Hoop Tendon = 1021.7 kips/Tendon
Dome Tendon = 1079.5 kips/Tendon
Vertical Tendon = 1157.7 kips/Tendon

In response to (b) and (c), the applicant provided the trend lines for the hoop, vertical, and dome tendons in graphical and tabular form. This information is as follows for the hoop tendons:

Trend lines for the hoop tendons

Year	Tendon	No of Wires	Actual Force (kips)	Year	Tendon	No of Wires	Actual Force (kips)
0.1	All	Avg. 169.14	1440.1	5.5	H39BC	170	1249.5
3.5	H1BA	170	1322.6	7.5	H8AB	166	1208.5
3.5	H6BA	166	1306.4	7.5	H14AB	170	1190.0
3.5	H12BA	163	1279.5	7.5	H18CA	170	1183.2
3.5	H17BA	170	1278.4	7.5	H20CA	170	1162.8
3.5	H24BA	170	1339.6	7.5	H25BC	170	1218.9
3.5	H25CA	168	1307.0	7.5	H33BC	170	1212.1
3.5	H29BC	170	1312.4	7.5	H36AB	170	1210.4
3.5	H32BA	170	1307.3	7.5	H38CA	170	1200.2
3.5	H36CA	170	1312.4	7.5	HH40BC	170	1198.5
3.5	H39BC	170	1300.5	7.5	H44CA	170	1235.9
5.5	H6AB	166	1248.3	12.5	H2AB	166	1231.7
5.5	H12AB	162	1195.6	12.5	H26AC	170	1217.2
5.5	H25CA	167	1190.7	12.5	H44BC	169	1269.2
5.5	H26AB	166	1165.3	17.5	H18CB	170	1147.5
5.5	H29AB	170	1190.0	17.5	H27CA	169	1177.9
5.5	H30CA	169	1240.5	17.5	H42BA	169	1225.2
5.5	H36CA	170	1256.3	22.5	H3BA	168	1228.1
5.5	H36BC	170	1232.5	22.5	H26CB	170	1144.1
5.5	H39AB	164	1130.0	22.5	H42CA	170	1242.7



The staff recognizes that subsequent inspections could result in a change in the trend line slopes. However, the applicant will manage this attribute by its Containment Inservice Inspection Program. On the basis of the additional information provided by the applicant, as well as the staff's evaluation, the staff considers the applicant's TLAA related to prestressing forces in the prestressing tendons of the FNP containment to be acceptable.

4.3.4.3 FSAR Supplement

Section A.4.3 of the LRA summarizes the applicant's analysis, without providing any quantitative existing and target values of prestressing forces. By RAI 4.3.4-2, the staff requested that the applicant provide the following information:

> Section A.4.3 in the UFSAR Supplement of the LRA, the applicant states, "The calculation indicates that acceptable containment prestress will continue to exist throughout the extended period of operation." In order for the summary to be meaningful, as a minimum, the applicant should provide a Table showing the minimum required prestressing forces and the projected (to 60 years) prestressing forces for each group of tendons which would demonstrate the validity of the analysis results. The applicant is requested to supplement this information in Section A.4.3 of the UFSAR Supplement.

In its response to RAI 4.3.4-2, dated March 5, 2004, the applicant committed to supplement Section A.4.3 of the LRA. The minimum required prestressing forces for the vertical, hoop, and dome tendons are 1157.7 kips/tendon, 1021.7 kips/tendon, and 1079.5 kips/tendon, respectively.

With this addition to the FSAR Supplement, the staff considers the information provided in Section A.4.3 to be acceptable.

4.3.4.4 Conclusion

On the basis of its review of the TLAA, the staff concludes that barring significant deviation in prestressing forces caused by time-dependent effects (creep and shrinkage of concrete and relaxation of prestressing forces), there is a reasonable assurance that the containment prestressing tendons will perform their intended function during the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii).

4.3.5 Fatigue of Reactor Vessel Supports

4.3.5.1 Summary of Technical Information in the Application

The applicant discussed the fatigue analysis of the RV supports in Section 4.3.5 of the LRA. The applicant indicated that WCAP-14422, Revision 2-A, identifies fatigue of the RV supports as a potential TLAA, if the supports were constructed in accordance with the 1963 version of the American Institute of Steel Construction (AISC) manual. The applicant indicated that FNP used the 1969 version of the AISC manual and, therefore, the existing analyses remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.3.5.2 Staff Evaluation

WCAP-14422, Revision 2-A, contains a generic fatigue assessment for Reactor Coolant System (RCS) supports, including the RV supports. The WOG assessment concluded that fatigue is not an aging effect that is a concern for the RCS support structures. The staff's safety evaluation agreed with the WOG conclusion for the materials represented in Table 2-4 of WCAP-14422, Revision 2-A. Renewal Applicant Action Item 6 indicated that a license renewal applicant should justify any difference between the materials used for the RCS supports and those listed in the WOG report. Section 3.3.1.7 of the staff's safety evaluation indicates that supports designed and constructed using the 1963 AISC manual may have been fabricated from materials that are not bounded by the WOG evaluation. The applicant indicated that FNP used the 1969 version of the AISC manual and, therefore, the concern identified in Renewal Applicant Action Item 6 is not applicable to FNP. Table 2-7 of WCAP-14422, Revision 2-A indicates that the 1969 AISC manual was used for the FNP supports. As a consequence, the staff concludes no FNP evaluation was required to address Renewal Applicant Action Item 6.

4.3.5.3 FSAR Supplement

In Section 4.3.5 of the LRA, the applicant stated that it used a later edition of the AISC for RCS support design. It did not provide any FSAR supplement in Appendix A of the LRA. By letter dated July 27, 2004, the applicant stated that because no fatigue calculations exist for RCS supports, and that there is no applicable aging mechanism to address, it determined that a TLAA does not exist for this issue. Therefore, it did not include a corresponding section in the FSAR Supplement for fatigue of reactor vessel supports. The staff agrees with the applicant's statement and conclusion.

4.3.5.4 Conclusion

The staff has reviewed the applicant's evaluation of fatigue of the RV supports and concludes that the applicant's actions satisfy the requirements of 10 CFR 54.21(c)(1)(i).

4.4 Environmental Qualification of Electrical Equipment

The 10 CFR 50.49 environmental qualification (EQ) program has been identified as a TLAA for the purposes of license renewal. The TLAA of EQ electrical components includes all long-lived, passive and active electrical and instrumentation and controls (I&C) components that are important to safety and located in a harsh environment. The harsh environments of the plant are those areas that are subjected to environmental effects by a loss-of-coolant accident (LOCA) or a high-energy line break (HELB). The EQ equipment comprises safety-related and Q-list equipment; nonsafety-related equipment, the failure of which could prevent satisfactory accomplishment of any safety-related function; and the necessary post accident monitoring equipment.

As required by 10 CFR 54.21(c)(1), the applicant must provide a list of EQ TLAAs in the LRA. The applicant shall demonstrate that one of the following is true for each type of EQ equipment—(i) the analyses remain valid for the period of extended operation, (ii) the analyses have been projected to the end of the period of extended operation, or (iii) the effect 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

The applicant stated in LRA Section 4.4, "Equipment Qualification," that its Environmental Qualification Program was established to demonstrate that certain electrical components are qualified to perform safety functions in the harsh environment following a design-basis accident (DBA). Elements of the proof of qualification involve the original 40-year license period. Hence, the qualification reports and calculations that comprise the EQ program meet the definition of a TLAA. In general, the applicant did not establish qualified lives for the components within the Environmental Qualification Program longer than the original 40-year license period.

As a result of its application, the applicant has stated that no additional components will be added to the Environmental Qualification Program. The applicant has already determined the qualified service lives for the EQ components and tracks them to determine when a component is nearing the end of its service life. For those components that are nearing the end of their qualified service life, the Environmental Qualification Program has provisions for the components to be reevaluated for longer service, refurbished, requalified, or replaced. The Environmental Qualification Program complies with the requirements of Appendix B to 10 CFR Part 50 and receives routine quality assurance audits. The applicant will continue this program through the extended period of operation (Appendix B.3.7), hence the TLAAs will be managed by an AMP, in accordance with 10 CFR 54.21(c)(1)(iii). The applicant also included a list of EQ packages in Table 4.4 of the LRA.

4.4.2 Staff Evaluation

The staff reviewed Section 4.4 of the LRA to determine whether the applicant submitted sufficient information to meet the requirements of 10 CFR 54.21(c)(1). For the electrical equipment identified in LRA Table 4.4, the applicant relies on 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' qualifications focused on how the Environmental Qualification Program manages the aging effects in order to meet the requirements delineated in 10 CFR 50.49.

The staff conducted an audit of the information provided in the LRA and the program bases documents, which are available at the applicant's engineering office. The audit findings and conclusions are documented in Audit and Review Report for Plant Aging Management Reviews and Programs, Farley Nuclear Plant, Units 1 and 2. On the basis of its audit, the staff finds that the applicant's Environmental Qualification Program, which the applicant claimed to be consistent with GALL AMP X.E1, "Environment Qualification of Electrical Components," is consistent with the EQ program in the GALL Report. Therefore, the staff finds that the applicant's Environmental Qualification Program is capable of programmatically managing the qualified life of components within the scope of the program for license renewal. The applicant's continued implementation of its Environmental Qualification Program provides reasonable assurance that the aging effects will be managed, and that components within the scope of the Environmental Qualification Program will continue to perform their intended functions for the period of extended operation.

4.4.3 FSAR Supplement

The applicant provided FSAR Supplement summary descriptions of its Environmental Qualification Program in Section A.3.1 of the LRA, and EQ calculations in Section A.4.4 of the LRA. On the basis of its review of the FSAR Supplement, the staff concludes the summary descriptions of the applicant's actions to address EQ of electrical components are adequate.

4.4.4 Conclusion

On the basis of this review, the staff concluded that the applicant has demonstrated that the effects of aging on the intended functions of electrical components will be adequately managed for the period of extended operation by the existing Environmental Qualification Program, as required by 10 CFR 54.21(c)(1)(iii). The staff also concluded that the FSAR Supplement contains a summary description of the programs and activities for the evaluation of EQ of electrical components, as required by 10 CFR 54.21(d).

4.5 Other Plant Specific Analyses

In Section 4.5 of the LRA, the applicant provided its evaluation of plant-specific TLAAs. The TLAAs evaluated include the following:

- ultimate heat sink silting
- leak-before-break analysis
- RHR relief valve capacity verification calculations

4.5.1 Ultimate Heat Sink Silting

4.5.1.1 Summary of Technical Information in the Application

In accordance with 10 CFR 54.17, the applicant submitted an evaluation of the TLAA of the ultimate heat sink (UHS) at FNP, Units 1 and 2. In its letter dated October 9, 2003, the applicant provided supplemental information to Section 4.5 of the LRA. Section 4.5.1 of the LRA discusses the UHS, which is a pond where silt deposition (silting) may occur. Excessive silting could adversely impact the capability of the service water system to perform its safety function to achieve a safe shutdown and maintain long-term cooling of the plant following a DBA.

The applicant stated that it conducts routine soundings of the UHS once every five years to confirm the water volume in the pond. The applicant evaluates the acceptability of these soundings to confirm the basis for TS 3.7.9, which requires the pond elevation to be checked every 24 hours to ensure that the surface elevation of the pond is at least 184 feet above sea level. The soundings confirm that, for this pond elevation, enough pond water volume exists for the plant to safely shut down and maintain long-term cooling.

Part of the acceptability criteria for the evaluation of the soundings is a curve (included in the LRA as Figure 4.5.1) showing the surface area of the pond versus the pond surface elevation, based on the requirements of the UHS. This curve establishes a minimum acceptable volume (with a margin) of 1325 acre-feet at a surface elevation of 184 feet. The applicant had validated this curve by trending the rate of change of the volume of the pond using data from prior surveillance soundings that are extrapolated to 40 years. For license renewal, the applicant extrapolated the calculation to 60 years to validate the acceptability curve and to determine if an update was necessary.

To extrapolate the calculation for the period of extended operation, the applicant incorporated surveillance data from soundings performed in 1993 and 1998. Data from an additional surveillance performed in August 2003 were not available at the time the applicant submitted the LRA. The calculation used the method of least squares to fit a curve through the data. Based on the calculations that included the 1993 and 1998 data, the applicant stated that the existing required pond volume remains conservative for the renewal term and adequately assures that enough pond water volume exists to achieve safe shutdown and maintain long-term cooling. Through this review and the revision of the analysis, the applicant stated that it has demonstrated that the TLAA is acceptable, as modified, for the renewed license term, in accordance with 10 CFR 54.21(c)(1)(ii).

4.5.1.2 Staff Evaluation

After reviewing the information contained in the LRA, the staff requested additional information from the applicant. In RAI 4.5.1-1, the staff requested the applicant to provide the following information:

> Section 4.5.1 "Ultimate Heat Sink Silting" of the FNP LRA states that the applicant has updated the design calculations pertaining to the surveillance of the Ultimate Heat Sink (UHS) to address silting induced aging. It is further stated that this update addresses the UHS silting issue for the additional 20 years of operations in the extended term in accordance with 10 CFR 54.21(c)(1)(ii). In order to complete the review of the UHS

silting issue at FNP site, the staff needs the following additional information:

a. Provide the UHS pond volume surveillance data from all the available sounding measurement records to date. (Raw sounding measurements data are not required.)

b. Provide the rate of siltation of the UHS pond that was observed in the past based on the periodic surveillance measurements made thus far. Also address the applicability of this measured rate to the remaining years of the current license period and the extended period of operation (i.e., are there any known future changes in the hydrology of the river likely to increase significantly sediment intake?)

c. Explain briefly the procedure that was used to determine the observed and projected rates of siltation mentioned in item b above, and summarize the significant results indicating the safety margin achieved in volume of water (acre-feet) in UHS.

The staff also met with the applicant on March 10, 2004, to discuss and clarify RAI 4.5.1-1. In its response to RAI 4.5.1-1(a), dated April 16, 2004, the applicant provided the UHS pond volume surveillance data from all the available sounding measurement records to date in a tabular form, which included the data from the soundings made in August 2003. In its responses to RAI 4.5.1-1(b) and (c), the applicant stated that the original calculation (before its update for license renewal) used the sounding data taken in the years 1981 to 1989 to predict the 40-year end of life (EOL) volume in the UHS. The calculation used a linear regression analysis and the method of least squares to plot a line through the data points. The slope of this line can be used to estimate the siltation rate. The slope of the line for the original calculation implied a siltation rate of 0.6333 acre-feet per year, but the line and the data did not correlate well. As a result, the predicted 40-year EOL volume in the UHS was reduced by 5 percent to 1325 acre-feet in the calculation. The applicant used the 1325 acre-feet value in the evaluation of the service water pond as the UHS, as described in FSAR Section 9.2.5.

The calculation update for the LRA incorporated the additional sounding data from the 1993 and 1998 surveillance, using the same linear regression analysis method. Incorporation of the additional data resulted in a positive slope in the volume versus time curve. The applicant calculated this volume increase to be 0.772825 acre-feet per year. Using the line developed from the analysis, the predicted 60-year EOL volume in the UHS pond would be 1461 acre-feet. However, the line and the data did not correlate well. Addition of the 2003 surveillance data led to a smaller, but still positive slope in the curve. The volume increase with time is 0.054 acre-feet per year, with a predicted 60-year EOL UHS volume of 1421 acre-feet.

In summary, the applicant stated that the UHS pond surveillance data show minor fluctuations in the pond volume (both positive and negative) occurring over time with no siltation trend indicated. The updated calculation and surveillance data demonstrate that the UHS pond volume during the period of extended operation will remain above the 1325 acre-feet used in the UHS analysis. The applicant further stated that the average operating conditions for the UHS pond (inflow from the river, outflow, runoff flow, etc.) have remained consistent throughout the current operating period. The applicant does not expect any changes in operating conditions or the hydrology of the river that would lead to an increase in sediment intake. In addition, the UHS pond volume surveillance would identify any unusual change. The average measured pond volume (from the 12 sets of data taken over the last 22 years) is 1418.5 acre-feet, which results in a margin of 7 percent above the 1325 acre-feet value used in the UHS analysis. The minimum recorded UHS pond volume is 1403 acre-feet (from the 1984 surveillance data), which results in 5.8 percent margin over the UHS analysis value of 1325 acre-feet.

The staff performed an independent regression analysis of the data furnished by the applicant and found that SNC's statements concerning the regression analysis were correct. Based on this confirmatory analysis, the staff concludes that SNC has demonstrated, through its revised analysis of all available data, that its TLAA is acceptable for the renewed license term, in accordance with 10 CFR 54.21(c)(1)(ii). Therefore, the staff agrees with SNC's conclusion that the existing required pond volume remains conservative for the renewal term and assures adequate pond water volume to safely shutdown and maintain long-term cooling.

4.5.1.3 FSAR Supplement

The applicant provided an FSAR Supplement summary description of its TLAA evaluation of the UHS silting issue in Section A.4.5 of Appendix A to the LRA. On the basis of its review of the FSAR Supplement, the staff concludes that the summary description of the applicant's actions to address the UHS silting issue is adequate.

4.5.1.4 Conclusion

The staff has reviewed the applicant's TLAA of the UHS silting at FNP and concludes that the applicant's actions and commitments satisfy the requirements of 10 CFR 54.21(c)(1)(ii). The staff has also reviewed the FSAR Supplement for the TLAA and finds that it contains a description of the TLAA for the UHS sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.5.2 Leak-Before-Break Analysis

4.5.2.1 Summary of Technical Information in the Application

In Section 4.5.2 of the LRA, the applicant stated it had performed a leak-before-break (LBB) analysis for the FNP primary coolant loop and the pressurizer surge line. The LBB analysis evaluated postulated flaw growth in the piping for the reactor coolant loops and the surge line. The applicant stated that these analyses meet the definition of a TLAA.

For the primary loop, the applicant updated the LBB analysis to account for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(ii). The result of the update shows that crack growth in the lines is negligible, and that the environmental factor for reactor water environments is not a significant parameter in the analysis.

For the LBB analysis of the pressurizer surge line, the applicant determined that the current analysis is bounding for 60 years, in accordance with 10 CFR 54.21(c)(1)(i). The basis for this conclusion is twofold—(1) the materials analyzed are not particularly susceptible to thermal aging, so the calculation did not make a 40-year assumption regarding thermal aging, and (2) the transient cycles assumed in the analysis are bounding for 60 years.

In a supplemental letter dated October 9, 2003, the applicant provided additional information related to Section 4.5.2 of the LRA. The applicant performed plant-specific LBB analyses for both units of FNP which are summarized in Section 3.6 of the FSAR. These analyses provide the technical justification for eliminating postulated breaks in the reactor coolant loop (RCL) piping (except for the accumulator and RHR branch connections) and pressurizer surge line from the structural design basis. For the RCL, Westinghouse performed an LBB analysis for the FNP primary coolant loop under WCAP-12825, “Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Design Basis for the Joseph M. Farley Units 1 and 2 Nuclear Power Plants,” dated January 1991. The non-proprietary version of this document is WCAP-12826. The pressurizer surge line LBB analysis was completed under WCAP-12835, “Technical Justification for Eliminating Pressurizer Surge Line Rupture from the Structural Design Basis for FNP Units 1 and 2,” dated April 1991. The non-proprietary version of this document is WCAP-12834. The staff accepted both versions of the two LBB analyses on April 12, 1991, and January 15, 1992, respectively.

The applicant stated that the staff has approved both LBB analyses methodology and results (referring to the 1991 and 1992 approvals). The applicant stated that these analyses address the aging effect of cracking. The applicant performed LBB crack stability evaluations for enveloping critical locations, which were determined based on loading, pipe geometry, and fracture toughness considerations. The applicant also carried out a fatigue crack growth analysis to demonstrate that fatigue crack growth is negligible. Assumptions in these analyses having a potential basis in the original 40-year term of operation are fracture toughness properties for cast austenitic stainless steel (CASS) materials due to thermal aging considerations and the cumulative cycles of design transients.

In a supplemental letter dated October 9, 2003, the applicant stated that it had performed a TLAA evaluation of the primary loop and pressurizer surge line LBB analyses. The applicant stated that Westinghouse revised the RCL LBB analysis under WCAP-12825 to account for the additional thermal aging of the CASS materials for the period of extended operation and issued Addendum 1 to WCAP-12825 in December 2002. The analysis accounts for the effects of thermal aging degradation of the CASS materials due to 60 years of operation. Using faulted loads, a margin of two exists between the critical flaw and the flaw having a leak rate of 10 gallons per minute. A margin of 10 exists between the calculated leak rate from the detectable leakage flaw and the FNP leak detection capability of one gallon per minute. The applicant stated that this meets the CLB, as required by action item 10 of the NRC Final Safety Evaluation Report for WCAP-14575-A, in which a margin on loads of one is satisfied. No CASS material for the FNP, Units 1 and 2, primary loop piping has been replaced; therefore, the second component of the action item is not applicable.

The applicant stated that an update of the pressurizer surge line LBB analysis was required for license renewal since the surge line does not contain CASS materials and since the transients assumed for 40 years are bounding for 60 years, as stated in Section 4.3 of the LRA. The applicant concluded that the analysis for the pressurizer surge line was reviewed and determined to be acceptable as-is for the extended license term.

4.5.2.2 Staff Evaluation

WCAP-12825 describes the application of LBB to the FNP, Units 1 and 2 RCS primary loop piping. This report provides the technical basis for evaluating postulated flaw growth in the main RCS piping under normal plus faulted loading conditions. The applicant performed LBB crack stability evaluations to envelop critical locations. The applicant also carried out a fatigue crack growth analysis for a postulated flaw to demonstrate that fatigue crack growth was negligible over 40 years. The staff concludes that this LBB analysis meets the definition of a

TLAA, as defined in Section 4.1 of NUREG-1800.

Since the primary loop piping contains cast stainless steel material, the thermal aging of the CASS material of the piping needs to be considered for the period of extended operation. Pursuant to 10 CFR 54.21(c)(1)(ii), the applicant projected the analyses to the end of the extended period by reanalysis. The applicant indicated that the analyses were revised, and Addendum 1 to WCAP-12825 was issued in December 2002. According to the acceptance criteria in Section 4.7.3.1.2 of NUREG-1800, the staff must review the documented results of the revised analyses to verify that their period of evaluation is extended such that they are valid for the period of extended operation. The applicant offered no evidence that Addendum 1 was approved, and therefore, the staff has not reviewed the acceptance criteria.

The staff asked the applicant in RAI 4.5.2-1 for the following information:

> Section 4.5.2 of the application states that for the RCL, Westinghouse revised the WCAP-12825 analysis of the primary loop piping to account for the additional thermal aging of the cast austenitic materials for the period of extended operation and issued Addendum 1 in December, 2002. Please provide docketed evidence that Addendum 1 to WCAP-12825 was reviewed and approved by the staff. If there is no docketed evidence, please submit the subject analysis for review.

By supplemental letter dated April 22, 2004, the applicant submitted both the proprietary and nonproprietary versions of WCAP-12825, Addendum 1, “Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Joseph M. Farley Units 1 and 2 Nuclear Power Plants for the License Renewal Program.” The staff noted that, in accordance with 10 CFR 50.59(c)(2)(viii), there was no departure from the evaluation method described in the FSAR for establishing the design bases between the version of WCAP-12825 which was accepted by the staff on April 12, 1991, and WCAP-12825, Addendum 1. In its updated LBB analysis, the applicant did not depart from the methodology previously approved by the staff’s April 12, 1991, safety evaluation: therefore, the staff concludes that the updated LBB analysis of the RCS piping, which accounts for the thermal aging of CASS, assures that the RCS piping will perform its intended function during the extended term, meeting the requirements of 10 CFR 54.21(c)(1)(ii). The staff finds this to be acceptable.

Since the V.C. Summer main coolant loop weld cracking event involving Alloy 82/182 weld material, the staff has been addressing the effect of primary water stress-corrosion cracking (PWSCC) on Alloy 82/182 piping welds on a generic basis for all currently operating PWR plants. To resolve this current operating issue, the industry is taking the initiative to (1) develop overall inspection and evaluation guidance, (2) assess the current inspection technology, and (3) assess the current repair and mitigation technology. An interim industry report, “PWR Materials Reliability Project Interim Alloy 600 Safety Assessment for US PWR Plants (MRP-44), Part 1: Alloy 82/182 Pipe Butt Welds,” was published in April 2001 to justify the continued operation of PWR plants while the industry completes the development of the final report. The staff documented its acceptance of this interim report in a safety evaluation issued June 14, 2001. The final industry report on this issue has not yet been published. Pending its receipt of the final report and additional ultrasonic test (UT) inspection data from piping involving Alloy 82/182 weld material from the industry, the staff is working towards resolution of this current operating issue pursuant to 10 CFR Part 50. Additionally, the staff issued RAI 4.5.2-1 requesting the applicant to (1) identify the locations in the FNP RCS piping that contain Alloy

82/182 welds, and (2) describe actions it has taken to address this operating experience.

In its supplemental letter dated April 29, 2004, the applicant stated that LRA Tables 3.1.2-1 and 3.1.2-3 identify the Alloy 82/182 locations. The FNP RCS (ASME Class 1) piping Alloy 82/182 piping butt weld locations are associated with RPV and pressurized nozzle-to-safe-end welds. These locations include the following:

- RPV primary inlet and outlet nozzle-to-safe-end welds (LRA Table 3.1.2-1)
- pressurizer surge, safety (3 nozzles), relief, and spray nozzle-to-safe-end welds (LRA Table 3.1.2-3)

The applicant stated that the FNP Alloy 82/182 pipe butt welds are characterized as high priority safety significant welds and are volumetrically examined in accordance with the FNP Risk-Informed Inservice Inspection Plan requirements for ASME Code Examination Category B–F welds. The applicant performs its volumetric examinations in accordance with Section XI of the ASME Boiler and Pressure Vessel Code, as amended by 10 CFR 50.55a. Consistent with the requirements of Appendix VIII to ASME Section XI, examination techniques and personnel are qualified through performance demonstration on realistic mockups. Implementation of performance-based requirements has resulted in the development and application of improved procedures for volumetric detection and characterization of PWSCC in pipe butt welds.

The applicant stated that visual examination of these weld locations for leakage continues to be performed in accordance with ASME Code Examination Category B–P. In addition to these inspection requirements, the Materials Reliability Program (MRP) recommends that a direct visual inspection of the bare metal, or an equivalent alternative inspection, be performed once within the next two refueling outages. The applicant is currently implementing this direct bare metal visual examination. The welds on the pressurizer and the RPV will be visually examined during the Unit 1 Fall 2004 outage. The six welds on the pressurizer, plus one of the RPV welds, were visually examined during the Unit 2 Spring 2004 outage with no problems noted. The remaining five welds on the RPV will be visually examined during the Unit 2 Fall 2005 outage.

The applicant stated that long-term inspection requirements will most likely change in response to new regulatory requirements from the NRC and industry recommendations from the MRP. SNC is an active participant in the industry's efforts to resolve issues associated with PWSCC of Alloy 82/182 pipe butt welds. After issuance and staff acceptance of a final material reliability program safety assessment for Alloy 82/182 pipe butt welds, SNC intends to implement the recommendations of this assessment at FNP. Finally, the applicant stated that it reviews both plant-specific and industrywide operating experience for applicability to FNP. The applicant would further evaluate any applicable events for their potential impact at FNP. The staff concludes that the applicant's involvement in current industry programs, as well as its interim inspection of Alloy 82/182 welds in accordance with ASME Appendix VIII, provides reasonable assurance that the RCS piping will perform its intended function during the extended term, thus meeting the requirements of 10 CFR 54.21(c)(1)(ii), and is, therefore, acceptable.

The applicant also completed a TLAA evaluation of the pressurizer surge line LBB analyses. The applicant determined that the pressurizer surge line LBB analysis did not require updating for the LRA because the surge line does not contain CASS materials. In addition, the transients assumed in the analysis for 40 years are bounding for 60 years. Because the number of cycles of fatigue the pressurizer surge line experiences during the extended term is used to bound the LBB analysis, the staff concludes that this LBB analysis meets the definition of a TLAA, as described in Section 4.1 of NUREG-1800.

Table 4.3.1 of the LRA indicates the current number of cycle counts and the projected maximum allowable number of cycle counts at 60 years of plant operation for transients in the design of Class 1 components. In RAI 4.3.1-1, the staff requested that the applicant describe the method that it will use to estimate the number of transient cycles that occurred prior to the installation of the fatigue monitoring software and to provide a list of transients that will be monitored by the fatigue monitoring program. This RAI resulted from the staff's review of the applicant's fatigue TLAA. Section 4.3 of this SER includes the staff's review of the applicant's response to this RAI.

4.5.2.3 FSAR Supplement

The applicant provided an FSAR Supplement summary description of its TLAA evaluation of the LBB analysis in Section A.4.6 of Appendix A to the LRA. On the basis of its review of the FSAR Supplement, the staff concludes that the summary description of the applicant's actions to address the LBB analysis is adequate.

4.5.2.4 Conclusion

The properties for the CASS piping material are acceptable because they will not degrade below the fully aged properties in the extended period of operation. The applicant has established a fatigue monitoring program to assure that the number of cycle counts for a transient set do not exceed its cycle limits. With respect to the potential for PWSCC of Alloy 82/182 welds, the staff is working towards resolution of this current operating issue pursuant to 10 CFR Part 50. Any measures to be implemented, or any requirements to be imposed, as part of the resolution of the PWSCC issue under 10 CFR Part 50, will also apply during the period of extended operation. Therefore, the staff concludes that the applicant has provided an acceptable TLAA regarding LBB and meets the requirements of both 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(ii).

4.5.3 Residual Heat Removal Relief Valve Capacity Verification Calculations

4.5.3.1 Summary of Technical Information in the Application

In Section 4.5.3 of the LRA, the applicant took credit for the relief capacity of the RHR relief valves in the cold overpressure mitigation analysis for FNP, Units 1 and 2. The applicant has a calculation that verifies relief valve capacity given the safe-operating pressure and temperature limit curves. The calculation adjusts the P-T limit curves to account for the flow-induced pressure drop from the beltline of the RV to the RHR relief valves. This calculation currently evaluates changes to P-T limit curves for 16, 24, 36, and 48 EFPYs. Because the applicant is evaluating the P-T limit curves for 54 EFPYs to support license renewal, the applicant stated that it will update this analysis to include the calculated 54-EFPY P-T limit curves before entering the PEO.

4.5.3.2 Staff Evaluation

Cold overpressure mitigation in FNP, Units 1 and 2, is accomplished using the RHR relief valves. The calculation verifies the relief capacity of the RHR valves. The applicant used the methodology described in the FSAR and will update the calculation at the time the license extension becomes effective. The staff finds the methodology and the applicant's commitment to update the RHR relief capability for the P-T curves in effect at the time the license extension becomes effective to be acceptable.

4.5.3.3 FSAR Supplement

The applicant provided an FSAR Supplement summary description of its TLAA evaluation of the RHR relief valve capacity verification calculations in Section A.4.7 of Appendix A to the LRA. On the basis of its review of the FSAR Supplement, the staff concludes that the summary description of the applicant's actions to address RHR relief valve capacity verification calculations is adequate.

4.5.3.4 Conclusion

The staff has reviewed the applicant's TLAA of the RHR relief valve capacity verification calculations at FNP, Units 1 and 2, and concludes that the applicant's actions and commitments satisfy the requirements of 10 CFR 54.21(c)(1)(ii). The staff has also reviewed the FSAR Supplement for the TLAA and finds that the FSAR Supplement contains a description of the TLAA for the RHR relief valve capacity verification calculations sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.6 Conclusion for Time-Limited Aging Analyses

The staff has reviewed the information in Section 4, "Time-Limited Aging Analysis," of the LRA. On the basis of its review, the staff concludes that the applicant has provided an adequate list of TLAAs, as defined in 10 CFR 54.3. Further, the staff concludes that the applicant has demonstrated that (1) the TLAAs will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i), (2) the TLAAs have been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii); or (3) the aging effects will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff has also reviewed the FSAR Supplement for the TLAAs and finds that the FSAR Supplement contains descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes that no plant-specific exemptions are in effect that are based on TLAAs, as required by 10 CFR 54.21©)(2).

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5. REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

On October 15, 2004, the U.S. Nuclear Regulatory Commission staff (the staff) issued its draft safety evaluation report (SER) related to the renewal of operating licenses for the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2. In accordance with Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR Part 54), the Advisory Committee on Reactor Safeguards (ACRS) is reviewing the license renewal application (LRA) for FNP, Units 1 and 2. On November 3, 2004, the applicant presented its LRA, and the staff presented its review findings as contained in the draft SER, to the ACRS Plant License Renewal Subcommittee. On November 30, 2004, the applicant provided comments to the staff's draft SER. The staff reviewed the applicant's comments. On March 3, 2005, the staff completed its review of the LRA and issued its SER related to the license renewal of the FNP, Units 1 and 2.

During its 521st meeting held on April 7, 2005, the ACRS Full Committee on Plant License Renewal completed its review of the FNP, Units 1 and 2, LRA and the staff's SER. The ACRS documented its findings in a letter to the NRC Chairman dated April 14, 2005. A copy of this letter is provided on the following pages of this SER Section.

April 14, 2005

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 2005-0001

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL APPLICATION FOR THE JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

Dear Chairman Diaz:

During the 521st meeting of the Advisory Committee on Reactor Safeguards (ACRS), April 7-8, 2005, we completed our review of the license renewal application for the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, and the related final Safety Evaluation Report (SER) prepared by the NRC staff. Our Plant License Renewal Subcommittee also reviewed this matter during a meeting on November 3, 2004. During our review, we had the benefit of discussions with representatives of the NRC staff and Southern Nuclear Operating Company, Inc. (SNC). We also had the benefit of the documents referenced. This report fulfills the requirement of 10 CFR 54.25 that the ACRS review and report on all license renewal applications.

CONCLUSIONS AND RECOMMENDATIONS

1. The programs established and committed to by the applicant will provide reasonable assurance that FNP Units 1 and 2 can be operated in accordance with their current licensing basis for the period of extended operation without undue risk to the health and safety of the public.

2. The SNC application for renewal of the operating licenses for FNP Units 1 and 2 should be approved.

BACKGROUND AND DISCUSSION

FNP Units 1 and 2 are 2775 MW_{th}, three-loop Westinghouse pressurized water reactors housed in pre-stressed/post-tensioned dry containment buildings. SNC requested renewal of the units' operating licenses for 20 years beyond the current license terms, which expire on June 25, 2017, for Unit 1, and March 31, 2021, for Unit 2.

In the final SER, the staff documents its review of the license renewal application and other information submitted by SNC and obtained during the audits and inspections conducted at the plant site. The SER also includes commitments identified by the staff and agreed to by the applicant. The staff reviewed the completeness of the applicant's identification of structures, systems, and components (SSCs) that are within the scope of license renewal; the integrated plant assessment process; the applicant's identification of the plausible aging mechanisms associated with passive, long-lived components; the adequacy of the applicant's aging management programs; and the identification and assessment of time-limited aging analyses (TLAAs) requiring review.

The FNP application either demonstrates consistency with the Generic Aging Lessons Learned (GALL) Report, or documents deviations to the specified approaches in the GALL Report. The FNP application is the first to be evaluated using a new audit and review process intended to confirm consistency with the GALL Report, and the acceptability of deviations from that report. This approach, which requires more review activities at the site, has resulted in improved communications and more effective interactions between the applicant and the staff, and a significant reduction in requests for additional information. During our meeting, the staff presented a well-structured and effective overview of its reviews, audits, and inspections.

Several scoping issues that in previous applications resulted in significant disagreement between the staff and applicants were promptly resolved at FNP due to the clear interim staff guidance. Among these issues were fuse holders, equipment required to recover from station blackout, and fire protection equipment. The staff disagreed with SNC in some areas, such as the scoping criteria for spray interactions in low-energy lines. We agree with the resolution of these issues, and the staff and SNC should be commended for promptly resolving them.

The applicant performed a comprehensive aging management review of all SSCs within the scope of license renewal. In the application, SNC describes 22 aging management programs for license renewal including existing, enhanced, and new programs. We agree that these programs are adequate.

We reviewed plant-specific operating experience to assess how effectively the applicant has dealt with age-related degradation. In 1987, FNP Unit 2 experienced a throughwall leak in an unisolable portion of the emergency core cooling system piping. The leak was attributed to thermal cycling due to valve leakage. This event led to the issuance of NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to the Reactor Coolant System." Since then, FNP has established accurate baseline cycle counts. For license renewal, the applicant developed a new fatigue monitoring program consistent with the GALL Report for monitoring fatigue of metal piping in components of the reactor coolant pressure boundary. The program will automatically monitor cycles using installed plant equipment.

As in previous reviews, we questioned the adequacy of opportunistic inspections of inaccessible buried piping and tanks, in lieu of periodic inspections at a plant-specific frequency, as specified in the GALL Report. The applicant has committed to enhancing its Buried Piping and Tank Inspection Program by performing an inspection within 10 years of entering the period of extended operation unless an opportunistic inspection has occurred within this 10-year period. This program enhancement is appropriate. The staff has also included this 10-year inspection as new generic guidance in the proposed revision to the GALL Report.

The applicant has also committed to perform an engineering evaluation before the 10^{th} year of extended operation to determine whether sufficient inspections have been conducted to draw a conclusion regarding the ability of the coatings to protect underground piping and tanks from degradation. If not, a focused inspection will be conducted to allow a conclusion to be reached.

We agree with the staff that the applicant has identified and properly addressed systems and components requiring TLAAs. The staff has independently verified the applicant's calculations of reactor vessel upper shelf energy and has confirmed that the limiting beltline materials at 60 years satisfy the acceptance criteria. We also note that the most limiting beltline materials satisfy the pressurized thermal shock criterion with ample margin based on both the applicant's and the staff's calculations.

When environmental factors are applied and projected to 60 years, cumulative usage factors (CUFs) for some piping locations may exceed a CUF of 1.0. For these locations, the applicant has committed to take corrective action prior to the period of extended operation. This action might include a more refined analysis, repair, replacement, and/or an inspection program approved by the NRC. We are satisfied with this commitment.

The licensee is improving FNP Units 1 and 2. New steam generators with Alloy 690 tubing, quatrefoil support plates, and full depth rolls were installed in both units in 2000 and 2001. Although control rod drive mechanism (CRDM) inspections have not identified leaks, both units are susceptible to CRDM cracking due to high head temperatures. Therefore, reactor vessel heads are being replaced with new heads that contain Alloy 690 penetrations without thermal sleeves. The licensee has also replaced the cooling towers and installed a dry cask storage facility.

Recent inspections of the reactor pressure vessel lower head penetrations of both units revealed no degradation. Bare metal visual inspections of Alloy 600/182/82 pressure boundary locations were also performed and did not reveal any degradation.

We agree with the staff that there are no issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) that preclude renewal of the operating licenses for Farley Units 1 and 2. The programs established and committed to by SNC provide reasonable assurance that the plant can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The SNC application for renewal of the operating licenses for FNP Units 1 and 2 should be approved.

Sincerely,

/RA/

Graham B. Wallis
Chairman

References

1. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report Related to the License Renewal of the Joseph M. Farley Nuclear Plant, Units 1 and 2," March 2005
2. Southern Nuclear Operating Company, Inc. "Joseph M. Farley Nuclear Plant License Renewal Application," September 2003
3. U.S. Nuclear Regulatory Commission, "Draft Safety Evaluation Report Related to the License Renewal of the Joseph M. Farley Nuclear Plant, Units 1 and 2," October 2004
4. U.S. Nuclear Regulatory Commission Inspection Report 50-348/2004-007, 50-364/2004-007, Scoping and Screening, June 22, 2004
5. Information Systems Laboratories, Inc., "Audit and Review Report for Plant Aging Management Reviews and Programs, Joseph M. Farley Nuclear Plant, Units 1 & 2," September 10, 2004

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6. CONCLUSIONS

The staff of the U.S. Nuclear Regulatory Commission (NRC or the Commission) reviewed the license renewal application for the Joseph M. Farley Nuclear Plant, Units 1 and 2, in accordance with Commission regulations and NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” dated July 2001. Title 10, Section 54.29, of the *Code of Federal Regulations* (10 CFR 54.29) provides the standards for issuance of a renewed license.

On the basis of its evaluation of the license renewal application, the NRC staff has determined that the requirements of 10 CFR 54.29(a) have been met.

The staff notes that the requirements of Subpart A of 10 CFR Part 51 regarding the Joseph M. Farley Plant, Units 1 and 2, are documented in Supplement 18 to NUREG-1437, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Joseph M. Farley Nuclear Plant, Units 1 and 2, Final Report,” published in March 2005.

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APPENDIX A: COMMITMENTS FOR LICENSE RENEWAL

During the review of the Joseph M. Farley, Units 1 and 2, LRA by the NRC staff, the applicant made commitments related to aging management programs (AMPs) to manage aging effects of structures and components (SCs) during the period of extended operation. The following table lists these commitments, along with the implementation schedule and the source of the commitment.

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
1	The Flow Accelerated Corrosion (FAC) program will be enhanced prior to entering the extended period of operation by adding the auxiliary feedwater pump turbine exhaust piping to the scope of the program.	A.2.8	Prior to entering the period of extended operation	LRA App B, Section B.4.1
2	An evaluation of the Diesel Fuel Oil Chemistry Control Program scope and the need to improve procedural guidance for maintaining and monitoring the diesel driven fire pump fuel oil system will be performed and any necessary changes implemented prior to the period of extended operation.	A.2.9	Prior to entering the period of extended operation	LRA App. B, Section B.4.2

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
3	The Structural Monitoring Program will be enhanced prior to entering the period of extended operation to include portions of structures and components which are in scope for license renewal but are not currently monitored. These additional structures and components include: • submerged portions of the Service Water Intake Structure (SWIS), • in-scope support features for ATWS, SBO, and fire protection safe shutdown equipment in the Turbine Building, • structural portions of the Oil Static Pump House, • in-scope components in the Low Level Radwaste Building and Solidification/Dewatering Building (e.g., fire protection). An enhancement will be made to the Structural Monitoring Program document to clarify the hangers and supports to be inspected in Category I buildings.	A.2.10	Prior to entering the period of extended operation	LRA App. B, Section B.4.3
4	The scope of the Service Water Program will be expanded prior to the period of extended operation to include inspection of piping from the main service water header to the air compressor credited for Appendix R safe shutdown and inspection of the service water pump columns.	A.2.11	Prior to entering the period of extended operation	LRA App. B, Section B.4.4

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
5	The FNP Fire Protection Program will be enhanced prior to entering the period of extended operation (with the exception of sprinkler head testing which will be implemented prior to 50 years of fire protection system service) as follows: • The fire protection sprinkler system piping will be subjected to wall thickness evaluations (e.g., non-intrusive volumetric testing and/or visual inspections during plant maintenance) prior to the period of extended operation and at specific intervals thereafter. The plant-specific inspection interval will be established from the initial inspection results and revised as appropriate for subsequent inspection results. • A sample of sprinkler heads will be inspected by using the guidance of National Fire Protection Association (NFPA) 25 (2002), Section 5.3.1.1.1, at or before 50 years service and every 10 years thereafter. • Diesel driven fire pump surveillance procedures will be upgraded to provide more detailed instructions related to inspection of the fuel oil supply piping. • The current practice of replacing CO2 hoses at 5 year intervals will be formalized in fire protection procedures.	A.2.12	Prior to entering the period of extended operation (with the exception of sprinkler head testing which will be implemented prior to 50 years of fire protection system service)	LRA App. B, Section B.4.5

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
6	The new FNP Reactor Vessel Internals (RVI) Program will be implemented prior to entering the period of extended operation to provide an integrated inspection program that addresses the reactor internals. It will supplement the inspection requirements of ASME Section XI, IWB Category B-N-3 to ensure that aging effects do not result in a loss of intended function of internal components during the period of extended operation. SNC will continue to participate in industry initiatives intended to clarify the nature and extent of aging mechanisms potentially affecting the FNP reactor internals. SNC will incorporate the results of these initiatives into the RVI Program. FNP will submit an inspection plan for the RVI Program for NRC review and approval at least 24 months prior to entering the periods of extended operation for the FNP units. The RVI Program will be consistent with the NUREG-1801 Programs XI.M13 and XI.M16, except as described above.	A.2.13	Program implementation: Prior to entering the period of extended operation Participation in industry initiatives: Ongoing Activity Submittal of inspection plan: At least 24 months prior to entering the period of extended operation for the FNP unit	LRA App. B, Section B.5.1 Letter NL-04-0715 pg E2-13, E2-15

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
7	The new Flux Detector Thimble Inspection Program will be implemented prior to entering the period of extended operation to formalize examinations already being performed. It will be used to identify loss of material due to fretting/wear in the detector thimbles during the extended period of operation. The program will include flux detector thimbles for both units. It does not include the instrument guide tubes, which are covered under the ISI Program and the Reactor Vessel Internals Program.	A.2.14	Prior to entering the period of extended operation	LRA App. B, Section B.5.2
8	The new External Surfaces Monitoring Program will be implemented prior to entering the period of extended operation. The FNP External Surfaces Monitoring Program will employ periodic visual inspections to manage accessible and insulated external surfaces susceptible to loss of material that require aging management for license renewal. Susceptible external surfaces include carbon steel and low alloy steels in inside and outside environments, and galvanized steel, cast iron, copper alloys, and aluminum in an outside environment. The FNP External Surfaces Monitoring Program is also credited for managing loss of material, cracking, and change in material properties in elastomers within the scope of the program.	A.2.15	Prior to entering the period of extended operation	LRA App. B, Section B.5.3 Letter NL-04-0924 pg E2-4; Letter NL-04-0678 pg E2-4

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
9	The new Buried Piping and Tank Inspection Program will be implemented prior to the period of extended operation. This program will be consistent with NUREG-1801 Program XI.M34, with the exception that it also includes provisions for inspection of buried stainless steel and copper alloy piping. This program will be used to manage loss of material from the external surfaces of in-scope pressure-retaining buried carbon steel piping and tanks, as well as buried stainless steel and copper alloy piping components. Buried piping and tanks within the scope of the program will be inspected when they are excavated for maintenance or when those components are exposed for any reason. SNC will perform an inspection of buried piping and tanks within ten years after entering the period of extended operation, unless an opportunistic inspection has occurred within this ten-year period. Before the tenth year, SNC will perform an engineering evaluation to determine if sufficient inspections have been conducted to draw a conclusion regarding the ability of the underground coatings to protect the underground piping and tanks from degradation. If not, SNC will conduct a focused inspection to allow that conclusion to be reached.	A.2.16	Prior to entering the period of extended operation	LRA App. B, Section B.5.4 Letter NL-04-0473 pg E1-23 Letter NL-05-0340

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
10	The new One-Time Inspection (OTI) Program will be implemented prior to the period of extended operation. The One-Time Inspection Program will include measures to verify the effectiveness of various other aging management programs and confirm the absence of aging effects. Insofar as practical with respect to scheduled outages, the inspections will be performed within a window of five years immediately preceding the period of extended operation. This program will be consistent with the aging management programs described in NUREG-1801 XI.M32 and XI.M33. <u>Specific Components Included in OTI Sample Population</u>: • Pressurizer cast austenitic stainless steel spray heads and associated coupling/ lock bar • Examination of Reactor coolant system small bore (<4-inch NPS) ASME Class 1 piping components, consistent with NUREG-1801 Section XI.M32 requirements, to address NRC concerns regarding cracking due to SCC or thermal cycling. This examination will also serve as an indicator of the potential for SCC in other stainless steel components exposed to a borated water environment • An RCP thermal barrier CCW nozzle • Cast iron, bronze, brass and other alloy components in any system requiring aging management that are exposed to environments that may lead to selective leaching	A.2.17	Inspections to be completed prior to entering the period of extended operation (as noted in the commitment)	LRA App. B, Section B.5.5 Letter NL-04-0924 pg E2-11 Letter NL-04-0318 pg E-17 & 19

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
10 cont'd	• A bounding CVCV letdown orifice or charging/SI pump miniflow orifice (based on pressure drop) • Sample portion of the external surface of the service water piping in the Diesel Generator Building which is obscured by guard piping • TDAFWP lube oil coolers (fouling of the tubes in a lube oil environment) • U-1 Condensate Storage Tank bottom (thickness measurement) <u>General LRA Systems In-Scope</u>: The OTI Program will select and inspect representative locations from the general LRA systems based on the applicable material/environment/aging effect combinations (as specified in the LRA and docketed correspondence) to confirm an aging effect does not require management and verify aging management program effectiveness. Alloy steel steam/fluid traps in a steam and treated water environment will be included in the scope of the OTI Program.			

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
11	The plant-specific NiCrFe Component Assessment Program will be implemented prior to the period of extended operation. The program scope will include nickel base alloy reactor coolant pressure boundary components with known or potential susceptibility to primary water stress corrosion cracking (PWSCC), excluding steam generator tubes, which are specifically addressed by the Steam Generator Program, and Reactor Internals which are addressed by the Reactor Vessel Internals Program. SNC will continue to participate in industry initiatives (such as the Westinghouse Owners Group and EPRI Materials Reliability Program). Susceptibility rankings and program inspection requirements will be consistent with the latest version of the EPRI Materials Reliability Program safety assessment regarding Alloy 82 / 182 pipe butt welds or its successors. FNP will submit an inspection plan for the NiCrFe Component Assessment Program for NRC review and approval at least 24 months prior to entering the periods of extended operation for the FNP units.	A.2.18	Program implementation: Prior to entering the period of extended operation Participation in industry initiatives: Ongoing Activity Submittal of inspection plan: At least 24 months prior to entering the period of extended operation for the FNP unit	LRA App. B, Section B.5.8 Letter NL-04-0715 pg E1-6 Letter NL-04-0967 pg E-6

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
12	FNP will implement the new Non-EQ Cables and Connections Program. The Non-EQ Cables and Connections Program consists of two parts. The first part addresses non-EQ electrical cables and connections used in circuits with sensitive, high voltage, low-level signals such as radiation monitoring and nuclear instrumentation. An AMP designed specifically for these types of cables will be implemented as an alternate program to the XI.E2 program described in NUREG-1801. All in-scope instrument circuit cables with sensitive, high voltage, low-level signals which are installed in adverse localized environments will be tested. The other part addresses non-EQ electrical cables and connections exposed to adverse localized environments caused by heat, radiation, or moisture and inaccessible medium voltage cables that are simultaneously exposed to significant moisture and voltage. This program section will be implemented consistent with NUREG-1801 programs XI.E1 and XI.E3.	A.2.19	Prior to entering the period of extended operation	LRA App. B, Section B.5.6 Letter NL-04-0678 pg E1-18

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
13	The FNP Fatigue Monitoring Program will be fully implemented consistent with NUREG-1801 Program X.M1 prior to the period of extended operation. The Fatigue Monitoring program will be used to monitor fatigue conditions of the metal piping and components that form the reactor coolant pressure boundary (RCPB). Specifically included will be the pressurizer subcomponents, the RPV shell and head, RPV inlet and outlet nozzles, reactor coolant piping, charging nozzles, safety injection nozzles and the other Class 1 piping one-inch in diameter or larger. The other Class 1 components that have received a fatigue analysis will also be included, since the cycles they were designed for are bounded by the cycle limits used by the program. When fully implemented, the program will include: • Cycle Counting - Plant transients that are significant contributors to the fatigue cumulative usage factor will be monitored and counted; • Thermal stratification monitoring - susceptible locations (NRC Bulletin 88-08) will be monitored; • Stress-based fatigue monitoring of the surge line and lower region of the pressurizer (includes thermal stratification and insurge/outsurge effects).	A.3.2	Prior to entering the period of extended operation	LRA App. B, Section B.5.7

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
14	The application of the appropriate environmental factors to the calculations for the following locations resulted in an environmentally-assisted fatigue adjusted value greater than 1.0. For the locations listed below, SNC will take corrective action prior to the period of extended operation which might include a more refined analysis, repair, replacement, and/or an inspection program approved by the NRC. • Charging nozzles and alternate charging nozzles • RHR 6-inch RHR/SI nozzles to the Reactor Coolant System cold leg.	A.4.2.1	Prior to entering the period of extended operation	LRA Section 4.3.1
15	SNC will update the RHR Relief Valve Flow Capacity analysis that utilizes P/T curves as an input to include the calculated 54 EFPY P/T Limit Curves prior to the period of extended operation.	A.4.7	Prior to entering the period of extended operation	LRA Section 4.5.3
16	Prior to the period of extended operation FNP will collect data for transients (pressurizer heat-up, small step increase/decrease in load of 10% full power per minute, and large step increase in load) not counted prior to the installation of the fatigue monitoring software and use the data to develop a best estimate historical count and an expected 60-year count.	N/A	Prior to entering the period of extended operation	LRA Section 4.3.1
17	FNP will use the NUREG-1437 Supplemental Environmental Impact Statement for Farley Nuclear Plant along with the original Farley Environmental Impact Statement as the basis for any environmental reviews performed during the renewal term.	Appendix D	Prior to entering the period of extended operation	LRA App. D

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
18	Reactor Vessel Surveillance Program: For each unit, FNP will install alternative dosimetry to monitor neutron fluence on the reactor vessel after removal of the last surveillance capsule in that unit. After all surveillance capsules have been removed, the exposure conditions of the reactor vessel will be monitored to ensure consistency with those used to project the effects of embrittlement to the end of the license period. Any plant operating restrictions (on parameters such as inlet temperature, neutron flux, etc.) will be determined. The program will include provisions that if reactor vessel exposure conditions are altered such that analysis assumptions could be invalidated, appropriate actions will be performed (e.g., re-evaluation, re-instituting an active surveillance program, notifying the NRC, etc.) to assure the adequacy of the projection to the end of the license period.	N/A	Prior to operation after removal of the last surveillance capsule in that unit	LRA App. B, Section B.3.4 (and consistency with NUREG-1801 Section XI.M31)

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
19	SNC will submit the following information on the Unit 1 flux thimble tubes (after the second inspection of the new tube materials during U1R20): • The worst case cumulative wear from the U1R20 flux thimble tube eddy current inspection. • The uncertainty applied to the actual measured wear data. • The thimble tube wall thickness. • The schedule for the next Unit 1 flux thimble tube inspection (inspection interval). • The projected wear value for the worst case wear location at the end of the next inspection interval. • A discussion of the technical basis for establishing the Unit 1 inspection interval that will be implemented after performing the U1R20 flux thimble tube eddy current inspection of the new tube materials. The discussion will address the use of the equation in Proprietary WCAP-12866 and the unit-specific wear data in projecting the wear to the next inspection outage. The curve coefficient (i.e., exponent "n") used in the projection of flux thimble tube wear will be provided.	N/A	After the second inspection (during U1R20 in 2006) and wear projection analysis is completed	Letter NL-04-1096 pg E-5

Item No.	Commitment	LRA Appendix A	Implementation Schedule	Source
20	The following Periodic Surveillance and Preventive Maintenance Activities credited for license renewal are to be implemented prior to the period of extended operation: • Boric Acid Tank Diaphragms Inspections • Reactor Makeup Water Storage Tank Diaphragms Inspections • Condensate Storage Tank Diaphragms Inspections	A.2.20 (provided in NL-04-1038 pg E-8)	Prior to entering the period of extended operation	Letter NL-04-1038 pg E-8 to E-11 (new LRA Section B.5.9)

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APPENDIX B: CHRONOLOGY

This appendix contains a chronological listing of the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC) staff and the Southern Nuclear Operating Company (SNC), and other correspondence regarding the NRC staff's reviews of the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2 (under Docket Numbers 50-348 and 50-364) license renewal application (LRA).

September 12, 2003	In a letter, NL-03-1657 (signed by J. Beasley, Jr.), SNC submitted its LRA for the Joseph M. Farley Nuclear Plant, Units 1 and 2. ML032721353
September 30, 2003	In a letter (signed by P. Kuo), NRC informed SNC of the receipt of the LRA for FNP Units 1 and 2 and Tilda Liu will be the PM for safety review and Jack Cushing will be PM for environmental review. ML032731456
October 1, 2003	In a memorandum (signed by T. Liu), NRC summarized the September 23, 2003 meeting between the NRC staff and SNC to discuss the FNP LRA. ML032760306
October 8, 2003	In a memorandum (signed by J. Funches), NRC granted a partial fee waiver for FNP's LRA. ML032820040
October 9, 2003	In a letter, NL-03-2098 (signed by J. Beasley, Jr.), SNC submitted expanded information on Section 4.5 of LRA related to Time Limited Aging Analysis. ML032870360
October 24, 2003	In a letter (signed by P. Kuo), NRC informed SNC the LRA was accepted and sufficient for docketing and proposed review schedule. ML032970522
October 29, 2003	In a letter (signed by T. Liu), NRC provided SNC a revised schedule for the conduct of review for FNP. ML033030051
October 30, 2003	In a letter (signed by P. Kuo), NRC issued notice of opportunity for hearing for the LRA for FNP. ML033040243
December 2, 2003	In a memorandum (signed by T. Liu), NRC summarized the October 27, 2003 conference call between the NRC staff and SNC regarding draft Request for Additional Information (RAI) concerning the staff's review of the LRA. ML033390305
December 5, 2003	In a letter, NL-03-2418 (signed by J. Beasley, Jr.), SNC provided NRC supplemental information and a future action commitment list regarding the LRA. ML033430278
December 12, 2003	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML033520279
December 12, 2003	In a letter (signed by T. Liu), NRC provided SNC requests for additional

	information concerning its review of the LRA. ML033520302
December 23, 2003	In a letter (signed by T. Liu), NRC provided SNC a revised schedule for the conduct of the NRC's review of the LRA. ML033580545
January 9, 2004	In a letter, NL-04-2623 (signed by L. M. Stinson), SNC provided a response to NRC concerning RAIs related to the staff's review of the LRA. ML040150414
January 9, 2004	In a memorandum (signed by T. Liu), NRC summarized the December 3, 2003 conference call between the NRC staff and SNC to discuss SNC's proposed responses to draft RAIs concerning the LRA. ML040120057
January 22, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040230175
February 3, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040340729
February 10, 2004	In a memorandum (signed by T. Liu), NRC summarized the December 11, 2003 and January 22, 2004 conference calls between the NRC staff and SNC to discuss SNC's proposed responses to draft RAIs concerning the LRA. ML040410293
February 13, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040440296
February 13, 2004	In a memorandum (signed by T. Liu), NRC summarized the January 21, 22, and 23, 2004 conference calls between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML040440428
February 20, 2004	In a letter, NL-04-0069 (signed by L.M. stinson), SNC provided RAI responses to the NRC. ML040570661
February 23, 2004	In a letter, NL-04-0264 (signed by L. M. Stinson), SNC notified NRC of SNC's plans for withdrawal and analysis of standby capsules. ML040560337
February 25, 2004	In a memorandum (signed by T. Liu), NRC summarized the January 28 and February 5, 2004 conference calls between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML040610023
February 26, 2004	In a memorandum (signed by T. Liu), NRC summarized the February 13, 17, and 18, 2004 conference calls between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML040580696
March 2, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML0406404940

March 5, 2004	In a letter, NL-04-0372 (signed by L. M. Stinson), SNC provided NRC a standby capsule withdrawal schedule. ML040690698
March 5, 2004	In a letter, NL-04-0318 (signed by L. M. Stinson), SNC provided a response to NRC concerning RAIs related to the staff's review of the LRA. ML040710873
March 8, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040680889
March 12, 2004	In a letter, NL-04-0383 (signed by L. M. Stinson), SNC provided a response to NRC concerning RAIs related to the staff's review of the LRA. ML040780586
March 12, 2004	In a memorandum (signed by T. Liu), NRC summarized the March 1, 2, and 3, 2004 conference calls between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML040750419
March 17, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040770911
March 22, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040820914
March 23, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040830725
March 23, 2004	In a memorandum (signed by T. Liu), NRC summarized the February 18, 2004 conference call between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML040830748
March 29, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040890705
March 30, 2004	In a memorandum (signed by T. Liu), NRC summarized the March 10, 2004 conference call between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML040910027
March 31, 2004	In a letter, NL-04-0384 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML040970359
April 1, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML040920318
April 2, 2004	In a memorandum (signed by T. Liu), NRC summarized the March 22, 24 and 25, 2004 conference calls between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML040960134

April 7, 2004	In a letter, NL-04-0473 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041050600
April 8, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML041000295
April 12, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML041040721
April 16, 2004	In a letter, NL-04-0617 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041180569
April 21, 2004	In a memorandum (signed by T. Liu), NRC summarized the March 29, 30 and April 2, 2004 conference calls between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML041130097
April 22, 2004	In a letter, NL-04-0678 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041190361
April 22, 2004	In a letter, NL-04-0654 (signed by L. M. Stinson), SNC provided Westinghouse Technical Report WCAP - 12825 to NRC to supplement RAIs related to the staff's review of the LRA. ML041190103
April 22, 2004	In a memorandum (signed by T. Liu), NRC summarized the April 7, 8 and 12, 2004 conference calls between the NRC staff and SNC to discuss draft RAIs concerning the LRA. ML041170401
April 29, 2004	In a letter, NL-04-0715 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041270481
April 29, 2004	In a report, "Audit and Review Plan for Plant Aging Management Reviews and Programs, Joseph M. Farley Nuclear Plant, Units 1 and 2," NRC outlined an audit and review plan for the aging management review and aging management program related to the FNP LRA. ML042540243
May 5, 2004	In a letter, NL-04-0800 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041350266
May 10, 2004	In a letter, NL-04-0831 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041390518
May 17, 2004	In a memorandum (signed by T. Liu), NRC summarized the April 21, 26 and 30, 2004 conference calls between the NRC staff and SNC to

discuss RAIs concerning the LRA. ML041380394

May 17, 2004	In a letter (signed by T. Liu), NRC agreed to withhold information in Westinghouse Technical Report WCAP - 12825 concerning its review of the LRA from public disclosure per request of SNC. ML041380426
May 26, 2004	In a letter (signed by T. Liu), NRC provided SNC a revised schedule for the conduct of review for FNP. ML041470141
May 28, 2004	In a letter, NL-04-0924 (signed by L. M. Stinson), SNC provided an Errata to their original application and responses to followup questions. ML041560314
June 2, 2004	In a memorandum (signed by T. Liu), NRC summarized the March 15, 16, 17, and 18, 2004 conference calls between the NRC staff and SNC to discuss RAIs concerning the LRA. ML041540528
June 4, 2004	In a letter, NL-04-0933 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041670508
June 10, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML041620321
June 10, 2004	In a letter, NL-04-0967 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041670393
June 18, 2004	In a letter, NL-04-1038 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041740361
June 22, 2004	In a letter (signed by C. Casto), NRC provided SNC Inspection Report 50-348/2004-007 and 50-364/2004-007 concerning its review of the LRA. ML041750021
June 25, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML041890305
June 25, 2004	In a letter, NL-04-1096 (signed by L. M. Stinson), SNC provided responses to NRC concerning RAIs related to the staff's review of the LRA. ML041890305
June 25, 2004	In a memorandum (signed by T. Liu), NRC summarized the May 17, 20, 24, 26, and June 2, 4 and 7, 2004 conference calls between the NRC staff and SNC to discuss RAIs concerning the LRA. ML041800088
June 29, 2004	In a memorandum (signed by T. Liu), NRC summarized the June 3, 2004 meeting between the NRC staff and SNC to discuss RAIs concerning the

LRA. ML041810407

July 09, 2004	In a letter, NL-04-1218 (signed by L. M. Stinson), SNC provided responses to supplemental RAI information. ML042010294
July 12, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML041940416
July 13, 2004	In a memorandum (signed by T. Liu), NRC summarized the June 9, 10, 21, 22, 23, 24, and July 6, 2004 conference calls between the NRC staff and SNC to discuss RAIs concerning the LRA. ML041950509
July 16, 2004	In a letter, NL-04-1296 (signed by L. M. Stinson), SNC provided responses to supplemental RAI information. ML042100057
July 20, 2004	In a letter, NL-04-1021 (signed by L. M. Stinson), SNC provided an annual application update to NRC. ML042160086
July 20, 2004	In a memorandum (signed by T. Liu), NRC summarized the July 6, 12, and 16, 2004 conference calls between the NRC staff and SNC to discuss RAIs concerning the LRA. ML042020601
July 27, 2004	In a letter, NL-04-1267 (signed by L. M. Stinson), SNC provided responses concerning RAIs and the Future Action Commitment List to NRC related to the staff's review of the LRA. ML042180163
July 28, 2004	In a letter (signed by T. Liu), NRC provided SNC requests for additional information concerning its review of the LRA. ML042010294
July 29, 2004	In a memorandum (signed by T. Liu), NRC summarized the July 26, 2004 conference calls between the NRC staff and SNC to discuss RAIs concerning the LRA. ML042110496
August 5, 2004	In a letter, NL-04-1396 (signed by L. M. Stinson), SNC provided supplemental information for certain previously submitted RAI responses related to the staff's review of the LRA. ML042260375
August 19, 2004	In a letter, NL-04-1486 (signed by L. M. Stinson), SNC provided supplemental information for the review of the LRA. ML042390474
August 25, 2004	In a memorandum (signed by T. Liu), NRC summarized the August 3, 11, and 13, 2004 conference calls between the NRC staff and SNC to discuss questions pertaining to the LRA. ML042380469
August 31, 2004	In a letter, NL-04-1594 (signed by L. M. Stinson), SNC provided supplemental information for the review of the LRA. ML042530095
September 8, 2004	In an audit trip report (signed by D. Thatcher), NRC summarized the scoping and screening methodology audit regarding the Southern Nuclear

	Operating Company license renewal application for the Farley Nuclear Plant, dated September 12, 2003. ML042520177
September 10, 2004	In an audit report, "Audit and Review Report for Plant Aging Management Reviews and Programs, Joseph M. Farley Nuclear Plant, Units 1 and 2," NRC summarized it audit and review on aging management review and aging management programs associated with the FNP LRA. ML042540277
September 14, 2004	In a letter, NL-04-1781 (signed by L. M. Stinson), SNC provided revisions to its Future Action Commitment List to NRC regarding its LRA. ML042670363
September 14, 2004	In a letter (signed by T. Liu), NRC provided SNC a request for additional information concerning its review of the LRA. ML042590013
September 15, 2004	In a memorandum (signed by T. Liu), NRC summarized the September 14, 2004 conference call between the NRC staff and SNC to discuss an RAI concerning the LRA. ML042590026
September 15, 2004	In a letter, NL-04-1801 (signed by L. M. Stinson), SNC provided response to NRC concerning an RAI related to the staff's review of the LRA. ML042670361
February 24, 2005	In a memorandum (signed by T. Liu), NRC summarized the February 24, 2005, conference call between the NRC staff and SNC to discuss a followup question concerning the LRA. ML050550319
February 24, 2005	In a letter, NL-05-0340 (signed by L. M. Stinson), SNC provided response to NRC concerning a followup question related to the staff's review of the LRA. ML050630287
February 25, 2005	In a letter, NL-05-0366 (signed by L. M. Stinson), SNC provided a revision to its Future Action Commitment List to NRC regarding its LRA. ML050670393
March 3, 2005	In a letter, NL-05-0397 (signed by L. M. Stinson), SNC provided response to NRC concerning a followup question related to the staff's review of the LRA. ML050680166

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APPENDIX C: REQUESTS FOR ADDITIONAL INFORMATION

RAI	Issuance Date	Response Date
Section 1: Introduction and General Discussion		
Section 2: Structures and Components Subject to Aging Management Review		
RAI 2.0-1	March 2, 2004	March 31, 2004
RAI 2.0-2	March 23, 2004	April 7, 2004 April 22, 2004
2.1 Scoping and Screening Methodology		
RAI 2.1-1 **Supplemental Responses**	December 12, 2003	January 9, 2004 March 31, 2004 April 16, 2004 June 4, 2004
RAI 2.1-2 **Supplemental Response**	December 12, 2003	January 9, 2004 March 31, 2004
2.2 Plant-Level Scoping Results		
RAI 2.2-1	December 12, 2003	January 9, 2004
RAI 2.2-2	December 12, 2003	January 9, 2004
RAI 2.2-3	December 12, 2003	January 9, 2004
RAI 2.2-4	December 12, 2003	January 9, 2004
RAI 2.2-5 **Supplemental Responses**	March 23, 2004	April 22, 2004 June 10, 2004 June 18, 2004
2.3 Scoping and Screening Results - Mechanical Systems		
2.3.1 Reactor Vessel, Internals, and Reactor Coolant System		
2.3.1.1 Reactor Vessel		
RAI 2.3.1.1-3	Feb 13, 2004	March 12, 2004
2.3.1.2 Reactor Vessel Internals		
RAI 2.3.1.2-1	Feb 13, 2004	March 12, 2004
2.3.1.3 Reactor System and Connected Lines		
RAI 2.3.1.3-1	February 13, 2004	March 12, 2004

RAI	Issuance Date	Response Date
2.3.1.4 Steam Generators		
2.3.2 Engineered Safety Features		
2.3.2.1 Containment Spray System		
2.3.2.2 Containment Isolation System		
2.3.2.3 Emergency Core Cooling System		
2.3.3 Auxiliary Systems		
2.3.3.1 New Fuel Storage		
2.3.3.2 Spent Fuel Storage		
RAI 2.3.3.2-1	December 12, 2003	January 9, 2004
RAI 2.3.3.2-2	December 12, 2003	January 9, 2004
2.3.3.3 Spent Fuel Pool Cooling and Cleanup System		
2.3.3.4 Overhead Heavy and Refueling Load Handling System		
RAI 2.3.3.4-1	March 23, 2004	April 7, 2004
RAI 2.3.3.4-2	March 23, 2004	April 7, 2004
2.3.3.5 Open Cycle Cooling Water System		
RAI 2.3.3.5-1	March 23, 2004	April 22, 2004
2.3.3.6 Closed Cycle Cooling Water System		
RAI 2.3.3.6-1	March 23, 2004	April 22, 2004
RAI 2.3.3.6-2	March 23, 2004	April 22, 2004
2.3.3.7 Compressed Air		
RAI 2.3.3.7-1	March 23, 2004	April 22, 2004
RAI 2.3.3.7-2	March 23, 2004	April 22, 2004
RAI 2.3.3.7-3 **Supplemental Response**	March 23, 2004	April 22, 2004 June 10, 2004
RAI 2.3.3.7-4	March 23, 2004	April 22, 2004
2.3.3.8 Chemical and Volume Control System		
RAI 2.0-1	March 2, 2004	March 31, 2004

RAI	Issuance Date	Response Date
2.3.3.9 Control Room Area Ventilation System		
2.3.3.10 Auxiliary and Radwaste Area Ventilation System		
2.3.3.11 Primary Containment Ventilation System		
2.3.3.12 Yard Structures Ventilation System		
2.3.3.13 Fire Protection		
RAI 2.3.3.13-1	March 23, 2004	April 7, 2004
RAI 2.3.3.13-2	March 23, 2004	April 7, 2004
RAI 2.3.3.13-3	March 23, 2004	April 7, 2004
2.3.3.14 Diesel Fuel Oil System		
RAI 2.3.3.14-1	March 23, 2004	April 22, 2004
RAI 2.3.3.14-2	March 23, 2004	April 22, 2004
RAI 2.3.3.14-3	March 23, 2004	April 22, 2004
RAI 2.3.3.14-4	March 23, 2004	April 22, 2004
2.3.3.15 Emergency Diesel Generator System		
RAI 2.3.3.15-1	March 23, 2004	April 22, 2004
RAI 2.3.3.15-2	March 23, 2004	April 22, 2004
RAI 2.3.3.15-3 **Supplemental Response**	March 23, 2004	April 22, 2004 June 10, 2004
RAI 2.3.3.15-4	March 23, 2004	April 22, 2004
RAI 2.3.3.15-5	March 23, 2004	April 22, 2004
RAI 2.3.3.15-6	March 23, 2004	April 22, 2004
RAI 2.3.3.15-7	March 23, 2004	April 22, 2004
2.3.3.16 Demineralized Water System		
RAI 2.3.3.16-1	April 1, 2004	April 29, 2004
2.3.3.17 High Energy Line Break Dectection System		
RAI 2.3.3.17-1	March 23, 2004	April 22, 2004
2.3.3.18 Hydrogen Control System		

RAI	Issuance Date	Response Date
2.3.3.19 Liquid Waste and Drains System		
RAI 2.3.3.19-4	April 1, 2004	April 29, 2004
2.3.3.20 Oil-Static Cable Pressurization System		
RAI 2.3.3.20-1	December 12, 2003	January 9, 2004
RAI 2.3.3.20-2	December 12, 2003	January 9, 2004
2.3.3.21 Potable and Sanitary Water System		
RAI 2.3.3.21-1	March 23, 2004	April 7, 2004
2.3.3.22 Radiation Monitoring System		
RAI 2.3.3.22-1	March 23, 2004	April 7, 2004
2.3.3.23 Reactor Makeup Water Storage System		
RAI 2.3.3.23-1 **Supplemental Response**	March 23, 2004	April 22, 2004 June 18, 2004
RAI 2.3.3.23-2	March 23, 2004	April 22, 2004
RAI 2.3.3.23-3	March 23, 2004	April 22, 2004
2.3.3.24 Sampling System		
RAI 2.3.3.24-1	March 23, 2004	April 22, 2004
2.3.4 Steam and Power Conversion System		
2.3.4.1 Main Steam System		
RAI 2.3.4.1-1	March 23, 2004	April 22, 2004
RAI 2.3.4.1-2	March 23, 2004	April 22, 2004
RAI 2.3.4.1-3	March 23, 2004	April 22, 2004
2.3.4.2 Feedwater System		
2.3.4.3 Steam Generator Blowdown System		
RAI 2.3.4.3-1	March 23, 2004	April 22, 2004
2.3.4.4 Auxiliary Feedwater System		
RAI 2.3.4.4-1	March 23, 2004	April 7, 2004
2.3.4.5 Auxiliary Steam and Condensate Recovery System		

RAI	Issuance Date	Response Date
RAI 2.3.4.5-4	April 1, 2004	April 29, 2004
2.3.4.6 Turbine and Turbine Auxiliaries		
RAI 2.3.4.6-1	April 1, 2004	April 29, 2004
2.4 Scoping and Screening Results: Containments, Structures, and Component Supports		
RAI 2.4-1	February 13, 2004	March 12, 2004
RAI 2.4-2 **Supplemental Response**	February 13, 2004	March 12, 2004 March 31, 2004
RAI 2.4-3	February 13, 2004	March 12, 2004
RAI 2.4-5	February 13, 2004	March 12, 2004
RAI 2.4-7	March 2, 2004	March 31, 2004
RAI 2.4-8	April 12, 2004	May 10, 2004
2.5 Scoping and Screening Results: Electrical and Instrumentation and Control Systems		
RAI 2.5-1	March 29, 2004	April 29, 2004
Section 3: Aging Management Review Results		
RAI 3.0-1	March 17, 2004	April 16, 2004
3.1 Aging Management of Reactor Vessel, Internals, and Reactor Coolant System		
RAI 3.1-1	February 3, 2004	March 5, 2004
RAI 3.1.3.1.1-1	March 17, 2004	April 16, 2004
RAI 3.1.3.1.2-1	March 17, 2004	April 16, 2004
RAI 3.1.3.2.1-1	March 17, 2004	April 16, 2004
RAI 3.1.2.4-1	March 22, 2004	April 22, 2004
RAI 3.1.2.4-2	March 22, 2004	April 22, 2004
RAI 3.1.2.4-3	March 22, 2004	April 22, 2004
RAI 3.1.2.4-4	March 22, 2004	April 22, 2004
RAI 3.1.2.4-5	March 22, 2004	April 22, 2004
RAI 3.1.2.4-6	March 22, 2004	April 22, 2004

RAI	Issuance Date	Response Date
RAI 3.1-4	March 29, 2004	April 29, 2004
3.2 Aging Management of Engineered Safety Features		
RAI 3.2-2	February 3, 2004	March 5, 2004
RAI 3.2-3	February 3, 2004	March 5, 2004
RAI 3.2-4	February 3, 2004	March 5, 2004
RAI 3.2-5	February 3, 2004	March 5, 2004
RAI 3.2-6	February 3, 2004	March 5, 2004
RAI 3.2-7	April 8, 2004	May 5, 2004
RAI 3.2-8	September 14, 2004	September 15, 2004
3.3 Aging Management of Auxiliary Systems		
RAI 3.3-3	February 3, 2004	March 5, 2004
RAI 3.3-4	February 3, 2004	March 5, 2004
RAI 3.3-5	February 3, 2004	March 5, 2004
RAI 3.3-6 **Supplemental Response**	March 8, 2004	April 7, 2004 May 28, 2004
RAI 3.3-7	March 8, 2004	April 7, 2004
RAI 3.3-8	March 8, 2004	April 7, 2004
RAI 3.3-9	March 8, 2004	April 7, 2004
RAI 3.3-10	March 8, 2004	April 7, 2004
RAI 3.3-11 **Supplemental Response**	March 8, 2004	April 7, 2004 May 28, 2004
RAI 3.3-12	March 8, 2004	April 7, 2004
RAI 3.3-13	March 8, 2004	April 7, 2004
RAI 3.3-14	March 8, 2004	April 7, 2004
RAI 3.3-15	March 8, 2004	April 7, 2004
RAI 3.3-16	March 8, 2004	April 7, 2004
RAI 3.3-17	March 8, 2004	April 7, 2004

RAI	Issuance Date	Response Date
3.3.2.1.1 New Fuel Storage		
3.3.2.1.2 Spent Fuel Storage (SFP)		
3.3.2.1.3 SFP Cooling and Cleanup System		
3.3.2.1.4 Overhead Heavy and Refueling Load Handling System		
3.3.2.1.5 Open-Cycle Cooling Water System		
RAI 3.3.2.1.5-1	March 8, 2004	April 7, 2004
3.3.2.1.6 Closed-Cycle Cooling Water System		
3.3.2.1.7 Compressed Air System		
RAI 3.3.2.1.7-1	March 8, 2004	April 7, 2004
3.3.2.1.8 Chemical and Volume Control System		
RAI 3.3.2.1.8-1	March 8, 2004	April 7, 2004
RAI 3.3.2.1.8-2	March 8, 2004	April 7, 2004
3.3.2.1.9 Control Room Area Ventilation System		
RAI 3.3.2.1.9-1	March 8, 2004	April 7, 2004
3.3.2.1.10 Auxiliary and Radwaste Area Ventilation System		
3.3.2.1.11 Primary Containment Ventilation System		
3.3.2.1.12 Yard Structures Ventilation System		
3.3.2.1.13 Fire Protection		
3.3.2.1.14 Diesel Fuel Oil System		
RAI 3.3.2.1.14-1	March 8, 2004	April 7, 2004
RAI 3.3.2.1.14-2	March 8, 2004	April 7, 2004
3.3.2.1.15 Emergency Diesel Generator System		
RAI 3.3.2.1.15-1	March 8, 2004	April 7, 2004
RAI 3.3.2.1.15-2 **Supplemental Response**	March 8, 2004	April 7, 2004 May 28, 2004
3.3.2.1.16 Demineralized Water System		
3.3.2.1.17 High Energy Line Break Detection System		

RAI	Issuance Date	Response Date
3.3.2.1.18 Hydrogen Control System		
3.3.2.1.19 Liquid Waste and Drains		
RAI 3.3.2.1.19-1	March 8, 2004	April 7, 2004
3.3.2.1.20 Oil-Static Cable Pressurization System		
3.3.2.1.21 Potable and Sanitary Water System		
RAI 3.3.2.1.21-1	March 8, 2004	April 7, 2004
3.3.2.1.22 Radiation Monitoring System		
3.3.2.1.23 Reactor Makeup Water Storage System		
RAI 3.3.2.1.23-1	March 8, 2004	April 7, 2004
3.3.2.1.24 Sampling System		
RAI 3.3.2.1.24-1	March 8, 2004	April 7, 2004
3.4 Aging Management of Steam and Power Conversion Systems		
RAI 3.4-1 **Supplemental Response**	February 3, 2004	March 5, 2004 April 7, 2004
RAI 3.4-3 **Supplemental Response**	February 3, 2004	March 5, 2004 May 28, 2004
RAI 3.4-5 **Supplemental Response**	February 3, 2004	March 5, 2004 April 7, 2004
RAI 3.4-6	February 3, 2004	March 5, 2004
RAI 3.4-7	February 3, 2004	March 5, 2004
3.5 Aging Management of Containments, Structures, and Component Supports		
RAI 3.5-1	February 3, 2004	March 5, 2004
RAI 3.5-2	February 3, 2004	March 5, 2004
RAI 3.5-4	February 3, 2004	March 5, 2004
RAI 3.5-5	February 3, 2004	March 5, 2004
RAI 3.5-7	February 3, 2004	March 5, 2004
RAI 3.5-8	February 3, 2004	March 5, 2004
RAI 3.5-9	February 3, 2004	March 5, 2004

RAI	Issuance Date	Response Date
RAI 3.5-12	March 22, 2004	April 22, 2004
RAI 3.5-13	March 29, 2004	April 29, 2004
RAI 3.5-14	March 29, 2004	April 29, 2004
RAI 3.5-15	June 10, 2004	June 25, 2004
RAI 3.5-16	June 10, 2004	June 25, 2004
3.6 Aging Management of Electrical Supports		
RAI 3.6.2-1	March 2, 2004	March 31, 2004
RAI 3.6.2-2	March 22, 2004	April 22, 2004
RAI 3.6.2-3	March 22, 2004	April 22. 2004
RAI 3.6.2-4 **Supplemental Response**	March 22, 2004	April 22, 2004 June 25, 2004
RAI 3.6.2-5	March 22, 2004	April 22, 2004
RAI 3.6.2-6 **Supplemental Response**	March 22, 2004	April 22, 2004 June 25, 2004
Section 4: Time Limited Aging Analysis		
RAI 4.0-1	March 17, 2004	April 16, 2004
4.1 Identification of Time Limited Aging Analysis		
4.2 Reactor Vessel Neutron Embrittlement		
4.2.1 Neutron Fluence		
RAI 4.2.1.3-1	March 17, 2004	April 16, 2004
4.2.2 Upper-Shelf Energy		
4.2.3 Pressurized Thermal Shock		
RAI 4.2.3.3-1	March 17, 2004	April 16, 2004
4.2.4 Adjusted Reference Temperature		
RAI 4.2.4.2-1	March 17, 2004	April 16, 2004
RAI 4.2.4.3-1	March 17, 2004	April 16, 2004
4.3 Metal Fatigue		
4.3.1 Fatigue of ASME Class 1 Components		

RAI	Issuance Date	Response Date
RAI 4.3.1-1	January 22, 2004	February 20, 2004
RAI 4.3.1-2	January 22, 2004	February 20, 2004
RAI 4.3.1-3	January 22, 2004	February 20, 2004
RAI 4.3.1-4	January 22, 2004	February 20, 2004
4.3.2 Fatigue of Reactor Coolant Pump Flywheel		
4.3.3 Fatigue of ASME Non-Class 1 Components		
RAI 4.3.3-1	January 22, 2004	February 20, 2004
4.3.4 Containment Tendon Pre-Stress		
RAI 4.3.4-1 **Supplemental Responses:**	January 22, 2004	March 5, 2004 April 16, 2004
RAI 4.3.4-2	January 22, 2004	March 5, 2004
4.3.5 Fatigue of Reactor Vessel Supports		
4.4 Environmental Qualification of Electrical Equipment		
RAI 4.4-1	March 2, 2004	March 31, 2004
4.5.1 Ultimate Heat Sink Silting Calculations		
RAI 4.5.1-1	March 17, 2004	April 16, 2004
4.5.2 Leak-Before-Break Analysis		
RAI 4.5.2-1	April 1, 2004	April 29, 2004
RAI 4.5.2-2	April 1, 2004	April 22, 2004
4.5.3 Residual Heat Removal Relief Valve Capacity Verification Calculations (including LTOP)		
Appendix B: Aging Management Programs and Activities		
RAI B-1	March 17, 2004	April 16, 2004
B.3.4 Rector Vessel Surveillance Program		
RAI B.3.4-1	April 12, 2004	May 10, 2004
RAI B.3.4-2	April 12, 2004	May 10, 2004
B.3.5 Borated Water Leakage Assessment and Evaluation Program		
RAI B.3.5-1	March 17, 2004	April 16, 2004

RAI	Issuance Date	Response Date
RAI B.3.5-2	March 17, 2004	April 16, 2004
B.5.1 Reactor Vessel Internals Program		
RAI B.5.1-2	April 1, 2004	April 29, 2004
RAI B.5.1-3 **Supplemental Response**	April 1, 2004	April 29, 2004 June 25, 2004
RAI B.5.1-4	April 1, 2004	April 29, 2004
B.5.2 Flux Detector Thimble Inspection Program		
RAI B.5.2-1 **Supplemental Response**	March 17, 2004	April 16, 2004 August 5, 2004
RAI B.5.2-3 **Supplemental Response**	March 17, 2004	April 16, 2004 June 25, 2004 July 16, 2004
RAI B.5.2-4	March 17, 2004	April 16, 2004
RAI B.5.2-5	March 17, 2004	April 16, 2004
B.5.3 External Surfaces Monitoring Program		
RAI B.5.3-1	February 3, 2004	March 5, 2004
B.5.8 NiCrFe Component Assessment Program		
RAI B.5.8-1 **Supplemental Response**	March 29, 2004	April 29, 2004 June 10, 2004
B.5.9 Periodic Surveillance and Preventive Maintenance Activities Program		
RAI B.5.9-1	July 12, 2004	July 16, 2004

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