Audit and Review Report for Plant Aging Management Reviews and Programs

Joseph M. Farley Nuclear Plant, Units 1 & 2
Docket Nos.: 50-348 and 50-364

September 10, 2004

Prepared by:
Information Systems Laboratories, Inc.
11140 Rockville Pike
Rockville, MD 20852
Contract No. GS-23F-0060-L

Prepared for:
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

Farley A&R Report

Table of Contents

ABBREVIATIONS

ACI	American Concrete Institute
ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
AMP	aging management program
AMR	aging management review
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
BWR	boiling water reactor
C	Celsius
CASS	cast austenitic stainless steel
CE	Combustion Engineering
CFR	Code of Federal Regulations
CGR	commodity group review
CLB	current licensing basis
CO_2	carbon dioxide
DBA	design basis accident
DE	Division of Engineering
DIPM	Division of Inspection Program Management
ECCS	emergency core cooling system
EDG	emergency diesel generator
EPRI	Electric Power Research Institute
ESF	engineered safety features
EQ	environmental qualification
F	Fahrenheit
FAC	flow accelerated corrosion
FNP	Joseph M. Farley Nuclear Plant, Units 1 & 2
GALL	generic aging lessons learned
GL	generic letter
HPSI	high-pressure safety injection
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and control
IASCC	irradiation assisted stress corrosion cracking
IGA	intergranular attack
IN	information notice
ISG	interim staff guidance
ISI	inservice inspection
ISL	Information Systems Laboratories
LRA	license renewal application

ABBREVIATIONS (continued)

MIC	microbiologically influenced corrosion
MRP	materials reliability program
MRP ITG	Material Reliability Project Issue Task Group
n/cm^2	neutrons per square centimeter
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NPS	nominal pipe size
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NUREG	Nuclear Regulatory Commission technical report
ODSCC	outside diameter stress corrosion cracking
ppm	parts per million
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
RAI	request for additional information
RCP	reactor coolant pump
RCS	reactor coolant system
RG	regulatory guide
RLEP-B	License Renewal and Environmental Impacts Program, Section B
RLSB	License Renewal and Standardization Branch
RPV	reactor pressure vessel
RPVS	reactor pressure vessel supports
RVI	reactor vessel internals
RWST	refueling water storage tank
SCC	stress corrosion cracking
SC	structures and components
SER	safety evaluation report
SG	steam generator
	Southern Nuclear Company
SRP-LR	standard review plan-license renewal
SSC	structures, systems, and components
SW	service water
TLAA	time-limited aging analysis
UFSAR	updated final safety analysis report
WCAP	Westinghouse Commercial Atomic Power
WOG	Westinghouse Owner's Group

Farley A&R Report

Audit and Review Report for Plant Aging Management Reviews and Programs Joseph M. Farley Nuclear Plant, Units 1 & 2

1. Introduction

By letter dated September 12, 2003 (ADAMS Accession Number ML032721360), Southern Nuclear Co., (SNC, the applicant) submitted to the U.S. Nuclear Regulatory Commission (NRC) its application for renewal of Facility Operating Licenses Nos. NPF-2 and NPF-8 for Joseph M. Farley Nuclear Plant, Units 1 & 2, respectively. The applicant requested renewal of the operating licenses for an additional 20 years.

In support of the staff's safety review of the Joseph M. Farley Nuclear Plant (FNP), Units 1 & 2, license renewal application (LRA), between October 2003 and February 2004, the License Renewal and Environmental Impacts Program, Section B (RLEP-B), led a project team that audited and reviewed certain aging management reviews (AMRs) and associated aging management programs (AMPs) that were developed by the applicant to support the FNP LRA. The project team included both NRC staff and contractor personnel provided by Information Systems Laboratories, Inc. (ISL), RLEP-B's technical assistance contractor. Attachment 1 lists the project team members as well as other NRC staff and ISL personnel who supported the project team's review.

The project team performed its work in accordance with the requirements of Title 10 of the *Code of Federal Regulations*, Part 54 (10 CFR 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants;" the guidance provided in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated July 2001; the guidance provided in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," dated July 2001; and the "Audit and Review Plan for Plant Aging Management Reviews and Programs - Joseph M. Farley Nuclear Plant, Units 1 & 2 (ADAMS Accession Number ML042540243)."

Overall, for its assigned scope of work, the project team determined that the applicant's aging management activities and programs will adequately manage the effects of aging on structures and components, so that their intended functions will be maintained consistent with the FNP current licensing basis (CLB) for the period of extended operation.

This report documents the results of the project team's audit and review work. The team performed its work at NRC Headquarters, Rockville, Maryland; at ISL offices in Rockville, Maryland; and at the applicant's offices in Birmingham, Alabama. The project team conducted site visits to the applicant's Birmingham, Alabama offices during the weeks of November 3, 2003 and December 15, 2003, and February 24 through 26, 2004. The team conducted a public exit meeting at the applicant's Birmingham, Alabama, office on February 26, 2004. Attachment 1 lists the applicant staff and other individuals contacted by the project team in support of the work documented in this report. It also lists those attending the public exit meeting.

2. Background

10 CFR 54.4 defines the scope of license renewal as those structures, systems, and components (SSCs) (1) that are safety-related, (2) whose failure could affect safety-related functions, or (3) that are relied on to demonstrate compliance with the NRC's regulations for fire protection, environmental qualification (EQ), pressurized thermal shock, anticipated transients without scram, and station blackout. An applicant for a renewed license must review all SSCs within the scope of license renewal to identify those structures and components (SCs) subject to an AMR. SCs subject to an AMR are those that perform an intended function without moving parts or without a change in configuration or properties, and that are not subject to replacement based on qualified life or specified time period. Pursuant to 10 CFR 54.21(a)(3), 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 CLB, for the period of extended operation. 10 CFR 54.21(d) requires that the applicant submit a supplement to the updated final safety analysis report (UFSAR) that contains a summary description of the programs and activities for managing the effects of aging.

The SRP-LR provides staff guidance for reviewing applications for license renewal. The GALL Report is a technical basis document. It summarizes staff-approved AMPs for the aging of a large number of SCs that are subject to an AMR. It summarizes the aging management evaluations, programs, and activities credited for managing aging for most of the SCs used by commercial nuclear power plants, and serves as a reference for both the applicant 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. 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 identifies (1) SSCs, (2) component materials, (3) environments to which the components are exposed, (4) aging effects associated with the materials and environments, (5) AMPs that are credited with managing the aging effects, and (6) recommendations for further applicant evaluations of aging effects and their management for certain component types.

The GALL Report is treated in the same manner as an approved topical report that is generically applicable. An applicant may reference the GALL Report in its LRA to demonstrate that its programs correspond to those that the staff reviewed and approved in the GALL Report. If the material presented in the LRA is consistent with the GALL Report and is applicable to the applicant's facility, the staff will accept the applicant's reference to the GALL Report. In making this determination, the staff considers whether the applicant has identified specific programs described and evaluated in the GALL Report but does not conduct a re-review of the substance of the matters described in the GALL Report. Rather, the staff confirms that the applicant verified that the approvals set forth in the GALL Report apply to its programs.

If an applicant takes credit for a GALL program, it is incumbent on the applicant to ensure that the plant program contains all the program elements (also called attributes) of the referenced GALL program. These elements are described in SRP-LR, Appendix A.1, "Aging Management Review - Generic (Branch Technical Position RLSB-1)." In addition, the conditions at the plant must be bounded by the conditions for which the GALL program was evaluated. The applicant must certify in its LRA that it completed the verifications and that they are documented and retained by the applicant in an auditable form.

As discussed in Section 4 of this report, the project team's work was focused on the applicant's commitments to GALL programs.

3. Summary of Information in the License Renewal Application

The FNP LRA closely follows the standard LRA format presented in the Nuclear Energy Institute (NEI) guidance, NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," Revision 3, April 2001. Section 3 of the FNP LRA provides the results of the AMR for SCs that the applicant identified as being subject to AMR.

3.1 FNP LRA Tables

FNP LRA Tables 3.0.4-1 and 3.0.4-2 provide descriptions of the internal and external service environments, respectively, used in the AMRs to determine the aging effects requiring management. Results of the AMRs are presented in two table types.

The first is Table 3.X.1, where the "3" indicates the table pertaining to the Chapter 3 AMR; the "X" indicates the table number from Volume 1 of the GALL Report (see the definition table below); and, the "1" indicates that this is the first table type (Table 1) in Section 3.X. For example, in the reactor vessel, internals, and reactor coolant system subsection, this is Table 3.1.1, and in the engineered safety features (ESF) subsection, this is Table 3.2.1.

X	Definition
1	Reactor Vessel, Internals, and Reactor Coolant System
2	Engineered Safety Features Systems
3	Auxiliary Systems
4	Steam and Power Conversion Systems
5	Containments, Structures, and Component Supports
6	Electrical and Instrumentation and Controls

The second table type is Table 3.X.2-Y, where "3" again indicates the LRA section number; "X" again indicates the table number from Volume 1 of the GALL Report; the "2" indicates that this is the second table type (Table 2) in Section 3.X; and "Y" indicates the system table number. For example, within the reactor vessel, internals, and reactor coolant system (RCS) subsection, the AMR results for the reactor vessel are presented in Table 3.1.2-1, and the results for the reactor vessel internals (RVI) are in Table 3.1.2-2. In the ESF subsection, the containment spray system results are presented in Table 3.2.2-1, and the containment isolation system is in Table 3.2.2-2.

The applicant compared the FNP AMR results with information set forth in the tables of the GALL Report and provided the results of its comparisons in two table types that correlate with the two table types described above.

3.1.1 FNP LRA Table 1

FNP LRA Table 1 provides a summary comparison of, for those SCs evaluated, the FNP aging management activities with the aging management activities specified in Volume 1 of the GALL Report. These tables are essentially the same as Tables 1 through 6 of the GALL Report, except that the "Type" column was replaced by an "Item Number" column, and the "Item Number in GALL" column was replaced by a "Discussion" column. The "Item Number in GALL" column provides a means to identify in LRA Table 2 the corresponding component type in LRA Table 1. The "Discussion" column includes further information. The following are examples of information that might be contained within the "Discussion" column.

(1) information on further evaluation required or reference to the location of that information

(2) the name of a plant-specific program being used

(3) exceptions to the GALL Report assumptions

(4) a discussion of how the line item is consistent with the corresponding line item in the GALL Report, when it may not be obvious

(5) a discussion of how the line item differs from the corresponding line item in the GALL Report, when it may appear to be consistent

Information in the table columns described below is taken directly from Volume 1 of the GALL Report: component, aging effect/mechanism, AMPs, further evaluation recommended. The Discussion column explains, in summary, how the applicant's evaluations and programs align with Volume 1 of the GALL Report.

3.1.2 FNP LRA Table 2

FNP LRA Table 2 provides the detailed results of the AMRs for those SCs that are subject to an AMR. There is a Table 2 for each of the AMR systems within a GALL Report system group. For example, the ESF system group contains tables specific to containment spray, containment isolation, and emergency core cooling. Table 2 consists of the following nine columns.

Component Type. Column 1 identifies the component types requiring AMR from Section 2 of the FNP LRA. The GALL Report, Volume 2 component item number or "GALL Report Reference" is denoted in italics below the component type where the component type is included in the GALL Report for the system. The applicant utilizes this notation to acknowledge where FNP components are described in the GALL Report (Vol. 2), even when significant differences may exist in material, environment, aging effects, and aging management strategies. For example, GALL Report (Vol. 2) component item V.A1.1 applies to the containment spray system piping, even though the aging effect determination is different (loss of material vs. cracking for GALL Report, Volume 2).

Intended Function. Column 2 identifies the applicable intended function(s) for each component type. Definitions and abbreviations of the intended functions are

contained in Table 2.1.4, ‘’Component and Structure Intended Functions” of Section 2 of the FNP LRA.

Material. Column 3 identifies the material(s) of construction for each component type.

Environment. Column 4 identifies the environment(s) for each component type. Where applicable, environment subcategories have been utilized to clarify the specific environment for the component type. For example, raw water environment subcategories include river water, potable water, and drainage. Table 3.0.4-1 and Table 3.0.4-2 of the FNP LRA identify the internal and external service environments.

Aging Effect Requiring Management. Column 5 identifies the aging effects requiring management for each component type, material, and environment combination. The aging effects requiring management are those effects that must be managed to maintain the intended function of the component type for the period of extended operation.

Aging Management Programs. Column 6 identifies the aging management programs credited for each component type to demonstrate that the aging effects requiring management will be adequately managed such that the intended function of the component type will be maintained for the period of extended operation.

GALL Report (Vol. 2) Item. Column 7 identifies applicable the GALL Report (Vol. 2) Aging Management Table item(s) to illustrate similarity between the GALL Report. The applicable GALL Report (Vol. 2) item identified is based on highlighting the best comparison between the FNP aging management strategy for the line item and a GALL Report (Vol. 2) Aging Management Table item. FNP identifies the best GALL Report (Vol. 2) item for illustrating similarity in an aging management strategy for the material and environment combination, regardless of component type. Identification of component types in the GALL Report associated with the FNP component type is provided as a sub-item in Column 1.

No entry is made in this column when there is no comparison that aids in the review of this item is identified.

Table 1 Item. Column 8 indicates a corresponding Table 1 (LRA Table 3.x.1) summary item number when a GALL Report (Vol. 2) Aging Management Table item is identified in Column 7. The Table 1 summary item number referenced correlates directly with the linkage provided in the “Item Number in GALL” column in Tables 1 through 6 of the GALL Report (Vol. 1).

Notes. Column 9 provides notes in each Table 2 which describe how the information in the table aligns with the information in the GALL Report. Each Table 2 contains both standard “lettered” notes and plant specific “numbered” notes. Notes that use letter designations are standard notes based on the letter from A. Nelson, NEI, to P. T. Kuo, NRC, “U.S. Nuclear Industry’s Proposed

Standard License Renewal Application Format Package, Request NRC Concurrence," dated January 24, 2003 (ML030290201) (Note that the staff concurred in the standardized format for LRAs by letter dated April 7, 2003, from P.T. Kuo, NRC, to A. Nelson, NEI (ML030990052)). Notes that use numeric designators are specific to FNP.

The standard "lettered" notes (e.g., A, B, C) provide generic information regarding comparison of the applicant aging management strategy with the GALL Report, Volume 2, Aging Management Table line item identified in Column 7. Only in special cases is more than one standard note entered for a component type, material, environment, aging effect requiring management, and aging management program line item.

Notes A through E indicate some level of consistency with the GALL Report, which aids in review of the line item. A GALL Report, Volume 2, Aging Management Table item is associated with the FNP line item whenever Notes A through E are utilized.

Notes F through J denote differences in material, environment, or aging effect requiring management that preclude a review aid comparison. When Notes F through J are utilized, there is no GALL Report, Volume 2 Aging Management Table item associated with the FNP line item.

The plant-specific numbered notes (e.g., 1, 2, 3) provide plant-specific information or clarification. These notes may indicate why an aging effect is or is not included, provide details regarding the program application, or differences between the FNP item and corresponding GALL Report, Volume 2 Aging Management Table items. Numbered, plant-specific notes are shown for each system group at the end of the system group Table 2s. The letter notes are described in detail in Section 7.2 of this audit and review report.

4. Audit and Review Scope

The AMRs and associated AMPs that the project team reviewed are identified in the "Audit and Review Plan for Plant Aging Management Reviews and Programs - Joseph M. Farley Nuclear Plant, Units 1 & 2," (FNP audit and review plan). The project team examined 17 of the FNP AMPs and associated AMRs. In general, the project team reviewed AMPs and AMRs that the applicant claimed were consistent with the GALL Report. The project team also reviewed certain plant-specific AMPs.

The applicant noted that some of its AMPs, including some that were reviewed by the project team, although described as consistent with the GALL Report, contained some deviations from the GALL Report. These deviations are of two types:

Exceptions to the GALL Report - Exceptions are specific GALL criteria that the applicant does not intend to meet or to implement.

Enhancements to the GALL Report - Enhancements are revisions or additions to plant procedures or program activities that the applicant will implement prior to the period of extended operation. Enhancements may expand, but not reduce, the scope of an AMP.

The project team reviewed all of the AMRs in the tables in Chapter 3 of the FNP LRA except those assigned to the Office of Nuclear Reactor Regulation (NRR), Division of Engineering (DE) staff. The items reviewed by the project team were consistent with the GALL Report, as identified by Notes A through E in the FNP LRA Table 3.X.2-Y (from Column 9 of the Table 2s discussed in Section 3 of this audit and review report), and all line items in Table 3.X.1.

5. Audit and Review Process

The project team followed the process detailed in the FNP audit and review plan. This process is summarized below.

5.1 FNP AMPs Consistent With the GALL Report

For the FNP AMPs for which the applicant claimed consistency with the AMPs in the GALL Report, the project team verified consistency. The team reviewed the AMP descriptions and compared seven of the ten program elements for those AMPs (as defined in Branch Technical Position RLSB-1 of SRP-LR, Appendix A) to the corresponding program elements for the GALL AMPs (Attachment 2 shows the ten program elements from the SRP-LR). As discussed in the FNP audit and review plan, the project team did not review program elements 7, "Corrective Action," 8, "Confirmation Process," or 9, "Administrative Controls." These elements were reviewed by the Office of Nuclear Reactor Regulation (NRR), Division of Inspection Program Management (DIPM) and the results were documented in Section 3 of the safety evaluation report (SER) related to the FNP LRA.

For each FNP AMP that had one or more of the deviations defined in Section 4 of this audit and review report, i.e., exception or enhancement, the project team reviewed each deviation to determine whether it was acceptable and whether the AMP, as modified by the applicant, would adequately manage the aging effects for which it is credited. In some cases, the project team identified differences that the applicant did not identify between the GALL AMPs credited by the applicant and FNP AMPs. In these cases, the team reviewed the difference to determine whether or not it was acceptable, and whether or not the AMP, as modified by the difference, would adequately manage the aging effects for which it is credited.

For those FNP AMPs that were not included in the GALL Report, i.e., plant-specific AMPs, the project team reviewed the AMP against the seven program elements from the SRP-LR. On the basis of its audit and review, the project team determined whether the AMPs would manage the aging effects for which they are credited.

5.2 FNP AMRs in the GALL Report

The AMRs in the GALL Report fall into two broad categories.

> Those that the GALL Report concludes are adequate to manage aging of the components referenced in the GALL Report.
>
> Those for which the GALL Report concludes that aging management is adequate, but further evaluation is recommended for certain aspects of the aging management process.

For its AMR reviews, the project team verified that the AMRs reported by the applicant to be consistent with the GALL Report are consistent with the GALL Report. For component groups evaluated in the GALL Report for which the applicant claims consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team reviewed the applicant's evaluation to determine whether it adequately addresses the issues for which the GALL Report recommend further evaluation.

5.3 NRC-Approved Precedents

As stated in the FNP audit and review plan, the project team did not review any AMPs or AMRs that were based on NRC-approved precedents.

5.4 UFSAR Supplement

Consistent with the SRP-LR, for the AMRs and associated AMPs that it reviewed, the project team also reviewed the UFSAR supplement that summarizes the applicant's programs and activities for managing the effects of aging for the period of extended operation.

5.5 Documents Reviewed by the Project Team

In performing its work, the project team relied heavily on the FNP LRA, the SRP-LR, and the GALL Report. The project team also examined the applicant's AMP basis documents (a catalog of the documentation used by the applicant to develop or justify its AMPs), and other applicant documents, including selected implementing procedures, to determine that the applicant's activities and programs would adequately manage the effects of aging on SCs.

Attachment 4 characterizes the nature and extent of the team's reviews of the applicant's documents and lists the documents reviewed by the project team. During its site visits, the project team also conducted detailed discussions and interviews with the applicant's license renewal project personnel and others with technical expertise relevant to AMR.

5.6 Commitments to be Included in the Safety Evaluation Report

Attachment 5 lists and summarizes the commitments made by the applicant that were reviewed by the project team. These commitments will be included in Appendix A of the SER related to the FNP LRA.

6. Exit Meeting

The project team held a public exit meeting with the applicant on February 26, 2004, to discuss the results of its audits and reviews of the AMPs and AMRs assigned to the team. These discussions reflected the team's work and its results, as documented in this report.

7. Audit and Review Results

The project team's audit and review activities for the FNP AMPs and AMRs, and its conclusions, are documented below.

During the audit and review, the project team reviewed the applicant's basis documents and interviewed the applicant' technical staff. Audit and review questions (follow-up items) that were

not answered or unresolved at the conclusion of the audit and review are documented and tracked in Attachment 3 of this report. Subsequently, the applicant provided various additional information via LRA Supplements to resolve these follow-up items. The project team reviewed the applicable LRA Supplements against the audit and review questions and determined that the supplements are acceptable. On the basis of its review, the project team determined that these follow-up items are resolved.

7.1 Aging Management Programs

The project team's audit and review activities for the FNP AMPs and its conclusions regarding these programs are documented below. The audit and review was performed in accordance with the guidance contained in the FNP audit and review plan in the manner summarized above.

7.1.1 INSERVICE INSPECTION PROGRAM (FNP AMP B.3.1)

In the FNP LRA, Appendix B, Section B.3.1, the applicant states that FNP AMP B.3.1, "Inservice Inspection Program," is an existing program that is consistent with GALL AMPs XI.M1, "Subsections IWB, IWC and IWD;" XI.M3, "Reactor Vessel Closure Studs;" XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS);" XI.S1, "Subsection IWE;" XI.S2, "Subsection IWL;" XI.S3, "Subsection IWF;" and XI.S4, "10 CFR 50, Appendix J."

7.1.1.1 Program Description

In the FNP LRA, the applicant states that its existing inservice inspection (ISI) program is implemented in accordance with 10 CFR 50.55a, "Codes and Standards," which imposes the ISI requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Component," for (1) Class 1, 2, and 3 pressure-retaining components and their integral attachments (Subsections IWB, IWC and IWD), (2) containment and integral attachments (Subsections IWE and IWL), and (3) the applicable component supports (Subsection IWF). The program manages loss of material, cracking, change in material properties, loss of preload/stress relaxation, loss of fracture toughness, and change in strength in concrete.

In the FNP LRA, the applicant states that the FNP inspections that accommodate the ISI requirements of ASME Section XI, Subsections IWB, IWC, and IWD, are performed to identify and correct degradation in Class 1, 2, and 3 pressure-retaining components and their integral attachments. Subsection IWE and IWL inspections are performed to identify and correct degradation in containment steel and concrete, other containment pressure-retaining components, and containment tendons. Subsection IWF inspections are performed to identify degradation in Class 1, 2, and 3 piping supports and other supports. Subsections IWB, IWC, and IWD portion of the FNP ISI program includes periodic visual, surface, and/or volumetric examinations and leakage tests of Class 1, 2, and 3 pressure-retaining components and their integral attachments, including welds, pump casings, valve bodies, and pressure-retaining bolting. These components and their integral attachments are identified either in ASME Section XI or in the applicant's commitments to perform augmented inservice inspections in accordance with ASME Section XI on components that are within the scope of license renewal.

The applicant states, in the FNP LRA, that the Subsection IWE portion of the FNP ISI program scope includes the containment liner and associated welds, base metal, pressure-retaining bolting, seals, gaskets, and moisture barriers. The steel liner and liner plate with its integral

attachments, including welds and base metal, are inspected in accordance with ASME Section XI, Subsection IWE. For ASME Section XI, Subsection IWE, Category E-P components, the FNP program uses the ISI examination requirements, examination methods, acceptance standards, and frequencies contained in 10 CFR 50, Appendix J.

The applicant states, in the FNP LRA, that the Subsection IWL portion of the FNP ISI program scope includes the reinforced concrete and unbonded post-tensioning systems of Class CC containments that are within the scope of license renewal for FNP. ASME Section XI, Subsection IWL, exempts from examination portions of the concrete containment that are inaccessible, such as those portions covered by the liner and foundation material, and those portions obstructed by adjacent structures or components.

7.1.1.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.3.1 is an existing program that is consistent with the following: (1) GALL AMP XI.M1, "Subsections IWB, IWC and IWD," (2) GALL AMP XI.M3, "Reactor Vessel Closure Studs," (3) GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)," (4) GALL AMP XI.S1, "Subsection IWE," (5) GALL AMP XI.S2, "Subsection IWL," (6) GALL AMP XI.S3, "Subsection IWF," and (7) GALL AMP XI.S4, "10 CFR 50, Appendix J."

The project team reviewed the documents listed in Attachment 4 of this report, in whole or in part, for the ISI program and interviewed the applicant's technical staff. The project team's review included SP-LR-AMP-01, "ISI Program Master Document," FNP-1-097, "ISI Plan Unit 1," FNP-1-096, "ISI Third 10-year Program," FNP-0-093, "Containment Inspection Plan," FNP-1/2-STP-117, "Containment ILRT," FNP-1/2-STP-167, "Containment Integrity Examination," and selected implementing procedures.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMPs XI.M1, XI.M3, XI.M12, XI.S1, XI.S2, XI.S3, and XI.S4 for consistency.

The Subsections IWB, IWC and IWD portion of the FNP ISI program, which addresses the criteria in GALL AMP XI.M1, "Subsections IWB, IWC and IWD," conducts visual, surface, and volumetric nondestructive examinations (NDE) of piping and components at various intervals in accordance with the 1989 edition of the ASME Section XI. The applicant submitted a risk-informed inservice inspection (RI-ISI) program for NRC approval in July 2003. By letter dated March 9, 2004 (ML040700258), the NRC approved the applicant's risk-informed ISI program. The staff concluded that the RI ISI program is an acceptable alternative to the current ISI program for Code Class 1, Categories B-F and B-J piping welds, and for Code Class 2, Categories C-F-1 and C-F-2 piping welds. The project team noted that the ISI AMP master document confirms that selected locations of Class 1 butt-welded small bore piping with a diameter of less than four inches will be included in the one-time inspection program (FNP AMP B.5.5). The applicant may use the risk-informed methodology to select locations to be inspected, but will not use it to eliminate the inspections. During its review, the project team asked the applicant to provide the number of ASME 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 (ML042010294), the applicant provides its response. In its response, the applicant states that the its RI-ISI program includes volumetric examination of one

ASME Class 1 small bore (defined as piping less than 4-inch nominal size) piping segment per unit. Specifically, the 2-inch drain line that tees off of the 3-inch nominal letdown line in each unit. The applicant states that the 2-inch circumferential butt weld at the tee in each unit is scheduled for ultrasonic examination under the RI-ISI program. As a clarification, the applicant states 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 project team finds this acceptable and consistent with the criteria in GALL AMP XI.M1.

For GALL AMP XI.M3, "Reactor Vessel Closure Studs," which addresses reactor head closure studs, the applicant performs visual, surface, and volumetric NDEs at various intervals in accordance with the 1989 edition of ASME Section XI. The project team finds this consistent with GALL AMP XI.M3.

For GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)," which addresses thermal aging embrittlement of CASS, the applicant used the screening criteria in the GALL Report to identify three components that require inspection. The reactor coolant pump (RCP) casing is included in the applicant's ISI program, the pressurizer head spray assembly is included in the one-time inspection program (FNP AMP B.5.5), and the Unit 1 loop elbow is evaluated within the time-limited aging analysis (TLAA) for leak-before break in FNP LRA Section 4.5.2.2. The project team finds this approach consistent with GALL AMP X1.M12.

For GALL AMP XI.S1, "Subsection IWE," which addresses ASME Section XI, Subsection IWE, the applicant follows inspection program B of ASME Section XI, with an inspection interval of ten years. ASME Section XI allows the applicant to choose one of the two acceptable inspection methodologies. FNP-0-M-093, "Containment Inspection Plan" specifies the extent of examinations and the type of examinations performed under this portion of the FNP ISI program. On this basis, the project team finds this approach consistent with GALL AMP X1.S1.

For GALL AMP XI.S2, "Subsection IWL," which addresses ASME Section XI, Subsection IWL, the applicant's containment tendon surveillance test procedure details the number of tendons selected for examination and testing. The applicant states that the FNP site characteristics include a non-aggressive environment and no flowing water, thus a plant-specific FNP AMP is not required. The project team reviewed the requirements of Interim Staff Guidance (ISG)-03, "Concrete Aging Management Program" and the GALL Report, Chapters II and III, which address aging management of concrete elements for inaccessible concrete. Based on this review, the project team finds that the applicant's conclusion is acceptable and consistent with GALL AMP X1.S2.

For GALL AMP XI.S3, "Subsection IWF," which addresses ASME Section XI, Subsection IWF, the applicant uses Code Case N-491 for selection of sample size for Class 1, 2, and 3 piping and component supports. The FNP program performs visual examinations at various intervals in accordance with the 1989 edition of ASME Section XI. The project team finds this acceptable and consistent with GALL AMP X1.S3 since the code case was approved for use by the NRC in 10 CFR 50.55a, and later editions of ASME Section XI have incorporated the sample size introduced in Code Case N-491.

For GALL AMP XI.S4, “10 CFR 50, Appendix J,” which addresses 10 CFR 50, Appendix J leakage testing, the applicant states that the program consists of performing perform visual examinations at various intervals in accordance with the requirements of 10 CFR 50, Appendix J, as recommended by the GALL AMP XI.S4.

Based on the its review, as discussed above, the project team determined that FNP AMP B.3.1 is consistent with the following GALL Report AMPs: (1) GALL AMP XI.M1, “Subsections IWB, IWC and IWD,” (2) GALL AMP XI.M3, “Reactor Vessel Closure Studs,” (3) GALL AMP XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS),” (4) GALL AMP XI.S1, “Subsection IWE,” (5) GALL AMP XI.S2, “Subsection IWL,” (6) GALL AMP XI.S3, “Subsection IWF,” and (7) GALL AMP XI.S4, “10 CFR 50, Appendix J.”

The project team performed a review of the applicable criteria in (1) GALL AMP XI.M1, “Subsections IWB, IWC and IWD,” (2) GALL AMP XI.M3, “Reactor Vessel Closure Studs,” (3) GALL AMP XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS),” (4) GALL AMP XI.S1, “Subsection IWE,” (5) GALL AMP XI.S2, “Subsection IWL,” (6) GALL AMP XI.S3, “Subsection IWF,” and (7) GALL AMP XI.S4, “10 CFR 50, Appendix J,” and the program description and program elements for the applicant’s FNP AMP B.3.1.

Based on the its review, the project team concludes that FNP AMP B.3.1 provides reasonable assurance of aging management of loss of material, cracking, change in material properties, loss of preload/stress relaxation, loss of fracture toughness, and change in strength in concrete in Class 1, 2, and 3 pressure-retaining components and their integral attachment, containment steel and concrete, other containment pressure-retaining components, and components tendons, Class 1, 2 and 3 piping supports and other supports and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria, as discussed in (1) GALL AMP XI.M1, “Subsections IWB, IWC and IWD,” (2) GALL AMP XI.M3, “Reactor Vessel Closure Studs,” (3) GALL AMP XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS),” (4) GALL AMP XI.S1, “Subsection IWE,” (5) GALL AMP XI.S2, “Subsection IWL,” (6) GALL AMP XI.S3, “Subsection IWF,” and (7) GALL AMP XI.S4, “10 CFR 50, Appendix J,” and the program description and program elements for the applicant’s FNP AMP B.3.1.

7.1.1.3 Exceptions to the GALL Report

None

7.1.1.4 Enhancements to the GALL Report

None

7.1.1.5 Operating Experience

The applicant states, in the FNP LRA, that it reviewed plant-specific ISI program performance results from six unit outages. The results showed that the ISI program has been effective in finding and correcting degradation attributable to aging effects requiring management. In addition, the applicant identified multiple instances where examinations had been performed to address industry operating experience at other plants.

The project team reviewed the applicant's plant operating experience in the ISI program master document as well as the results of the various ISI examinations. The ISI program identified degradation in several areas. These were captured in the applicant's corrective action program and subsequently dispositioned. These areas include (1) concrete leaching in the containment access tendon gallery, and although considered insignificant, inspections were scheduled in future outages; (2) a bulge in the containment liner was observed, but there was no thinning of plate or degradation; (3) a main steam support failure was identified, the cause was determined to be high cycle fatigue and the design deficiency was corrected; and (4) inspection of the reactor pressure vessel upper and lower head identified no cracking or leakage.

Based on the project team's review of the above operating experience and discussions with the applicants technical staff, the project team concludes that FNP AMP B.3.1 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.1.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the inservice inspection program in FNP LRA, Appendix A, Section A.2.1. The applicant states in Appendix A that the ISI program will be implemented during the renewal term in accordance with 10 CFR 50.55a, which imposes the ISI requirements of the ASME B&PV Code, Section XI, for Class 1, 2, and 3 pressure-retaining components and their integral attachments (Subsections IWB, IWC and IWD); containment and integral attachments (Subsections IWE and IWL); and the applicable component supports (Subsection IWF).

The applicant also states that continued implementation of the ASME Section XI, Subsections IWB, IWC, IWD, IWE, IWL, and IWF requirements in the FNP ISI program, including use of the examination requirements, examination methods, acceptance standards, and frequencies contained in 10 CFR 50, Appendix J, for Subsection IWE Category E-P components, will provide reasonable assurance that the aging effects will be managed such that the systems and components within the scope of the program will continue to perform their intended functions consistent with the licensing basis for the renewal term.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.1.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. Since the GALL program is acceptable to the staff, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.2 WATER CHEMISTRY CONTROL PROGRAM (AMP B.3.2)

In the FNP LRA, Appendix B, Section B.3.2, the applicant states that FNP AMP B.3.2, "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.

7.1.2.1 Program Description

In the FNP LRA, the applicant states that the water chemistry control program (FNP AMP B.3.2) 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 Electric Power Research Institute (EPRI) water chemistry guidelines in establishing chemistry control procedures. The applicant indicates that prior to adopting a later revision of the EPRI guidelines, it will evaluate the acceptability of any changes in implementing requirements. These FNP AMP documents are updated as necessary to reflect improved guidance and industry experience.

In the FNP LRA, the applicant credits the water chemistry control program (FNP AMP B.3.2) for aging management of components and commodity groups in the following systems and structures: auxiliary building (spent fuel pool), auxiliary feedwater, auxiliary steam and condensate recovery, chemical and volume control, closed cycle cooling water, containment spray, demineralized water, emergency core cooling, feedwater, main steam, open cycle cooling water (service water), reactor makeup water storage, sampling, and steam generator (SG) blowdown systems; emergency diesel generator (EDG); liquid waste and drains; pressurized water reactor (PWR) concrete containment (transfer canal); reactor vessel; RVI; reactor coolant system and connected lines; spent fuel cooling and cleanup; and SGs.

7.1.2.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.3.2 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 project team reviewed FNP AMP master documents, SP-LR-AMP-02, "Primary and Secondary Water Chemistry Master Document" and SP-LR-AMP-03, "Closed Cooling Water System Chemistry Master Document," FNP-0-ACP-58.2, "Primary Water Chemistry Strategic Plan," FNP-0-ACP-58.1, "Secondary Water Chemistry Strategic Plan," "FNP Closed Cooling Water Chemistry Control Program Exception Comparison," and FNP-0-ACP-58.3, "Closed Cooling Water Systems Strategic Plan." The project team also interviewed the applicant's technical staff.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMPs XI.M2 and XI.M21 for consistency.

GALL AMP XI.M2, "Water Chemistry," identifies EPRI TR-105714, Revision 3, "PWR Primary Water Chemistry Guidelines," for primary water chemistry, and EPRI TR-102134, Revision 3,

"PWR Secondary Water Chemistry Guidelines," for secondary water chemistry, both of which are earlier versions than the EPRI guidelines used in the FNP water chemistry control program. Although the applicant states that FNP AMP B.3.2 is consistent with the GALL AMP XI.M2, it did not identify the differing revisions of the EPRI guidelines in the FNP LRA.

The applicant justifies, in the FNP LRA, use of later revisions of the EPRI water chemistry guidelines as being consistent with the GALL Report philosophy of incorporating industry and plant-specific operating experience into aging management programs. In the FNP LRA, the applicant states that primary water chemistry control is currently based on EPRI TR-105714, "PWR Primary Water Chemistry Guidelines," Revision 4, Volumes 1 and 2. Secondary water chemistry control is currently based on EPRI TR-102134, "PWR Secondary Water Chemistry Guidelines," Revision 5. Closed cooling water chemistry control is currently based on the original issue of EPRI TR-107396, "Closed Cooling Water Chemistry Guideline," dated October 1997. Further, the applicant states, in the FNP LRA, that program changes associated with updates to these EPRI guidelines are evaluated for acceptability prior to incorporation.

By letter dated July 27, 2004 (ML042180163), the applicant provides its Supplement LRA. In its letter, the applicant states that EPRI has issued "EPRI PWR Primary Water Chemistry Guidelines Volume 1 and 2, Revision 5, 1002884, September 2003," and Revision 1 to TR-107396, "Closed Cooling Water Chemistry Guideline." Section B.3.2.2 of the FNP LRA references Revision 4 of the EPRI TR-105714 of the primary water chemistry guidelines, and original issue of EPRI TR-107396 of the closed cooling water chemistry guideline. The applicable procedures and program documents are being revised to incorporate the latest EPRI guidance.

The project team performed a review of the applicable criteria in GALL AMP XI.M2, "Water Chemistry," and GALL AMP XI.M21, "Closed-Cycle Cooling Water System," and the program description and elements that were determined by the applicant to be consistent with the corresponding program elements of these GALL AMPs. On the basis of its review, the project team determined that the applicant's FNP AMP B.3.2, "Water Chemistry Control Program" conform with the applicable, program elements and acceptance criteria in GALL AMP XI.M2, "Water Chemistry," and GALL AMP XI.M21, "Closed-Cycle Cooling Water System."

Based on its review, the project team concludes that, with the exception of the deviations identified by the applicant, the water chemistry control program provides reasonable assurance of aging management of loss of material and cracking within system components and structures in the following systems and structures: auxiliary building (spent fuel pool), auxiliary feedwater, auxiliary steam and condensate recovery, chemical and volume control, closed cycle cooling water, containment spray, demineralized water, emergency core cooling, feedwater, main steam, open cycle cooling water (service water), reactor makeup water storage, sampling, and steam generator (SG) blowdown systems; emergency diesel generator (EDG); liquid waste and drains; pressurized water reactor (PWR) concrete containment (transfer canal); reactor vessel; RVI; reactor coolant system and connected lines; spent fuel cooling and cleanup; and SGs, and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for the water chemistry control program, as discussed in GALL AMP XI.M2, "Water Chemistry," and GALL AMP XI.M21, "Closed-Cycle Cooling Water System. The project team's evaluation of the deviations identified by the applicant for the FNP AMP B.3.2 is given in Section 7.1.2.3 of this report.

7.1.2.3 Exceptions to the GALL Report

The applicant states, in the FNP LRA, an exception to the GALL Report elements as follows

Elements: 3: Parameters Monitored/Inspected
4: Detection of Aging Effects
5: Monitoring and Trending

Exception: The applicant's program addresses performance monitoring as outlined in Section 5 of EPRI TR-107396, while GALL AMP XI.M21 places emphasis on thermal-hydraulic performance testing for pumps and heat exchangers.

The GALL Report identifies the following criterion for the "parameters monitored/inspected" program element associated with the exception taken:

> The AMP monitors the effects of corrosion by surveillance testing and inspection in accordance with standards in EPRI TR-107396 to evaluate system and component performance. For pumps, the parameters monitored include flow and discharge and suction pressures. For heat exchangers, the parameters monitored include flow, inlet and outlet temperatures, and differential pressure.

The GALL Report identifies the following criterion for the "detection of aging effects" program element associated with the exception taken:

> Performance and functional testing in accordance with EPRI TR-107396 ensures acceptable functioning of the closed cycle cooling water system or components serviced by that system. For systems and components in continuous operation, performance adequacy is determined by monitoring data trends for evaluation of heat transfer fouling, pump wear characteristics, and branch flow changes.

The GALL Report identifies the following criterion for the "monitoring and trending" program element associated with the exception taken:

> Per EPRI TR-107396, performance and functional tests are performed at least every 18 months to demonstrate system operability, and tests to evaluate heat removal capability of the system and degradation of system components are performed every five years.

The project team reviewed the component cooling water (CCW) pump surveillance test results, the heat exchangers condition report history since 1989, and the applicant's mechanical operating experience report for the closed-cycle cooling water system. The project team reviewed plant operating experience and found that the CCW pumps and heat exchangers have not experienced any significant age-related failures. The project team also determined that aging effects in the closed-cycle cooling water system can be monitored and controlled by the water chemistry control program and by corrosion inspections for the components in systems treated with corrosion-inhibiting material.

On the basis of plant operating history and adequate management of aging effects, the project finds this exception to be acceptable.

7.1.2.4 Enhancements to the GALL Report

None

7.1.2.5 Operating Experience

The applicant states, in the FNP LRA, that the water chemistry control program incorporates the best practices of industry organizations, vendors, and utilities. The project team reviewed the applicant's operating experience report and the EPRI water chemistry guidance documents. During the audit, the project team 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 project team 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 project team finds that the applicant has made 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. Improvements have been based on the EPRI TR-105714. One improvement was to use materials more resistant to primary water stress corrosion cracking (PWSCC) in the replacement SGs. The applicant replaced the SGs at FNP Units 1 and 2 in 2000 and 2001, respectively. The applicant has also 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 the project team's review of the above operating experience and discussions with the applicant's technical staff, the project team concludes that FNP AMP B.3.2 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.2.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the water chemistry control program in FNP LRA, Appendix A, Section A.2.2. The applicant states in Appendix A that the water chemistry control program will manage aging during the period of extended operation through maintenance of low levels of detrimental impurities and the use of chemical additives.

The applicant states that the primary water chemistry control subprogram is based upon the guidance provided in EPRI TR-105714, Revision 4. The secondary water chemistry control subprogram is based upon the guidance provided by EPRI TR-102134, Revision 5. The closed cooling water chemistry control strategic plan is based upon the guidance contained in EPRI TR-107396, dated October 1997.

The project team reviewed the UFSAR supplement and concurs that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.2.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the exception to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.3 SERVICE WATER POND DAM INSPECTION PROGRAM (FNP AMP B.3.3)

In the FNP LRA, Appendix B, Section 3.3.1, the applicant states that FNP AMP B.3.3, "Service Water Pond Dam Inspection Program," is consistent with GALL AMP XI.S7, "Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

7.1.3.1 Program Description

In the FNP LRA, the applicant states that the service water pond dam inspection program performed in accordance with RG 1.127 is an acceptable basis for in-service inspection and surveillance of the dam and its associated slopes and spillway. The service water pond dam and spillway are inspected on a periodic basis in accordance with RG 1.127, Rev 1.

In the FNP LRA, the applicant states that the service water pond dam inspection program (FNP AMP B.3.3) addresses age-related deterioration, degradation due to environmental conditions, and the effects of natural phenomena that may affect water-control structures. Periodic monitoring of water-control structures ensures that the consequences of age-related deterioration and degradation can be detected and mitigated in a timely manner. The service water pond dam inspections include the earthen dam, the service water pond embankments, and the spillway slopes. Parameters monitored and inspected for the earthen embankment of the service water pond dam include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variance from originally constructed slopes), seepage, proper functioning drains, and degradation of slope protection features. Visual inspection is the primary means of detecting degradation of the service water pond dam.

7.1.3.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.3.3 is consistent with GALL AMP XI.S7, "Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for FNP AMP B.3.3, including FNP SP-LR-AMP-05, "Service Water Pond Dam Inspections Master Document," dated October 30, 2003, and FNP Engineering Technical Procedure, FNP-0-ETP-9389, Rev. 3, dated September 21, 1998, which provides an assessment of the AMP elements' consistency with GALL AMP XI.S7.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMP XI.S7 for consistency.

The project team performed a review of the applicable criteria in GALL AMP XI.S7, "Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," and the program description and elements for FNP AMP B.3.3, "Service Water Pond Dam Inspection Program." Based on its review, the project team concludes that FNP AMP B.3.3 provides reasonable assurance of aging management of age-related deterioration, degradation due to environmental conditions, and the effects of natural phenomena that may affect water-control in dam and its associated slopes and spillway and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for the service water pond dam inspection program, as discussed in GALL AMP XI.S7, "Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

7.1.3.3 Exceptions to the GALL Report

None

7.1.3.4 Enhancements to the GALL Report

None

7.1.3.5 Operating Experience

The applicant states, in the FNP LRA, that the service water pond dam inspection program (FNP AMP B.3.3) provides for biennial inspections conducted under FNP procedures using FNP acceptance criteria. A review of condition reports, supported by interviews, revealed that minor problems with vegetation, etc., have been detected. A recent example included some vegetation growth and some ant beds being found on the earthen dam structure in the rip-rap. These results were captured under the FNP Corrective Action Program and actions were initiated to correct these items.

The project team reviewed NRC/Federal Energy Regulatory Commission (FERC) audit reports that documented the effectiveness of service water pond inspections. No significant conditions or immediate concerns were noted in these audit reports. Additionally, the applicant conducts monthly walkdowns of the service water pond dam and surrounding areas and pond sounding survey every five years, in addition to RG 1.127 inspections every two to three years. Specific operating experience pertaining to these inspections includes recurring instances of grass, weed, brush, small tree growth, and some animal burrows. Other instances of damage at observation and relief wells and dam seepage were found.

Based on the project team's review of the above operating experience and discussions with the applicants technical staff, the project team concludes that FNP AMP B.3.3 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.3.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the service water pond dam inspection program in FNP LRA, Appendix A, Section A.2.3. The applicant states that the service water pond dam will be inspected during the period of extended operation on a periodic basis in accordance with RG 1.127, Rev. 1. The service water pond dam inspections include the earthen dam, the service water pond embankments, and the spillway slopes. As discussed above, service water pond dam inspections performed in accordance with RG 1.127 is an acceptable basis for in-service inspection and surveillance of the dam, its slopes, and associated spillway.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.3.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. Since the GALL program is acceptable to the staff, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.4 OVERHEAD AND REFUELING CRANE INSPECTION PROGRAM (FNP AMP B.3.6)

In FNP LRA, Appendix B, Section B.3.6.2, the applicant states that the FNP AMP B.3.6, "Overhead And Refueling Crane Inspection Program," is consistent with the GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

7.1.4.1 Program Description

In the FNP LRA, the applicant states that FNP AMP B.3.6 is a monitoring and inspection program. This program manages the effects of general corrosion of the crane bridge and trolley structural girders and beams and the crane rails and support girders for the spent fuel bridge cranes, spent fuel cask cranes, and the containment polar cranes. The contacting surfaces of the steel rails of these components are periodically inspected in accordance with plant procedures.

7.1.4.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.3.6, is consistent with GALL AMP XI.M23.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the document listed in Attachment 4 of this report for AMP B.3.6, including FNP AMP master document SP-LR-AMP-08, "Overhead and Refueling Crane Inspections," Maintenance

Procedure FNP-0-MP-30.3, “Spent Fuel Cask Crane Annual Mechanical Check,” Version 10.0, Maintenance Procedure FNP-1-MP-11.1, “Reactor Polar Crane Monthly Check,” and Fuel Handling Procedure FNP-1-FHP-5.13, “Manipulator Crane,” Version 10.0.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMP XI.M23 for consistency.

The project team performed a review of the applicable criteria in GALL AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems,” and the program description and elements for the applicant's FNP AMP B.3.6, “Overhead And Refueling Crane Inspection Program.” Based on its review, the project team concludes that FNP AMP B.3.6 provides reasonable assurance of aging management of the effects of general corrosion of the crane bridge and trolley structural girders and beams and the crane rails and support girders for the spent fuel bridge cranes, spent fuel cask cranes, and the containment polar cranes and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for overhead and refueling crane inspection program, as discussed in GALL AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.”

7.1.4.3 Exceptions to the GALL Report

None

7.1.4.4 Enhancements to the GALL Report

None

7.1.4.5 Operating Experience

The applicant states, in the FNP LRA, that the operating history review revealed that there has been no significant degradation of the crane bridge and trolley structural girders and beams, or the crane rails and support girders.

In the FNP master document SP-LR-AMP-08, the applicant provides a further description of its review of operating experience. The applicant reviewed NUREG-1774, “A Survey of Crane Operating Experience at U. S. Nuclear Plants from 1968 through 2002,” and identified four issues that were applicable to FNP. However, none of these issues involved age-related degradation. The applicant states, in the FNP master document, that a crane vendor (Whiting) identified a generic design deficiency concerning a possible over-stressed condition of internal support bolts. The nonconformance was a design deficiency and not related to aging.

Based on the project team’s review of the above operating experience and discussions with the applicants technical staff, the project team concludes that FNP AMP B.3.6 adequately manages the aging effects that have been observed at the applicant’s plant or at other nuclear power facilities.

7.1.4.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the overhead and refueling crane inspection program in FNP LRA, Appendix A, Section A.2.6. The applicant states that this program will be used during the period of extended operation to manage the effects of general corrosion of the crane bridge and trolley structural girders and beams and the crane rails and support girders for the spent fuel bridge, spent fuel cask and the containment polar cranes. The contacting surfaces of the steel rails of these components will be periodically inspected in accordance with plant procedures.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.4.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. Since the GALL program is acceptable to the staff, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.5 ENVIRONMENTAL QUALIFICATION PROGRAM (FNP AMP B.3.7)

In the FNP LRA, Appendix B, Section B.3.7.2, the applicant states that FNP AMP B.3.7, "Environmental Qualification Program," is consistent with GALL AMP X.E1, "Environmental Qualification (EQ) of Electrical Components."

7.1.5.1 Program Description

In the FNP LRA, the applicant states that the environmental qualification program is an existing program. This program manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, "Environmental Qualification Requirements," EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered TLAAs for license renewal. The EQ program ensures that these EQ components are maintained within the bounds of their qualification bases.

7.1.5.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.3.7, is consistent with GALL AMP X.E1.

The applicant states, in the FNP LRA, that the EQ program is an existing program that was established to meet plant commitments for 10 CFR 50.49.10, "Environmental Qualification Requirements."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the document listed in Attachment 4 of this report for AMP B.3.7, including FNP AMP master document SP-LR-AMP-09-R0 (previously LRSC-SNC-161-R2), "Environmental Qualification Program Master Document," FNP-0-M-60, "Environmental Qualification Program Description," and implementation procedure FNP-0-ETP-4108, "Environmental Qualification Program Implementation."

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMP XI.M23 for consistency.

As a result of its review, the project team identified the following differences between the GALL AMP and the FNP AMP in the program elements for EQ component reanalysis. These are (1) detection of aging effects, (2) monitoring and trending, and (3) acceptance criteria. These program elements, as described in the FNP AMP master document SP-LR-AMP-09-R0, did not explicitly address all of the content described in the GALL Report. Specifically, (1) the GALL AMP X.E1 provisions for EQ component reanalysis attributes, which are appropriate to 10 CFR 54.21(c)(1)(iii), were not evident in the AMP master document; (2) the program description for detection of aging effects did not fully describe monitoring or inspection of environmental conditions; (3) the program description for monitoring and trending did not fully describe proactive monitoring or inspection of environmental, condition, or component parameters; and (4) the program description for acceptance criteria did not fully describe the application of monitoring to modify a component qualified life, and establishment of plant-specific acceptance criteria.

The applicant responded that it would revise the FNP AMP master document SP-LR-AMP-09-R0 to address the above issues. The project team later verified that the applicant revised the FNP AMP master document, SP-LR-AMP-09, to address the above issues. Upon further review of the revised document, the project team concludes that the applicant's environmental qualification program is consistent with GALL AMP X.E1.

The project team also performed a review of the applicable criteria in GALL AMP X.E1, "Environmental Qualification (EQ) of Electrical Components," and the program description and elements for the applicant's FNP AMP B.3.7, "Environmental Qualification Program." Based on its review, the project team concludes that FNP AMP B.3.7 provides reasonable assurance of aging management of component thermal, radiation and cyclical aging and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for environmental qualification program, as discussed in GALL AMP X.E1, "Environmental Qualification (EQ) of Electrical Components."

7.1.5.3 Exceptions to the GALL Report

None

7.1.5.4 Enhancements to the GALL Report

None

7.1.5.5 Operating Experience

The applicant states, in the FNP LRA, that it has made improvements to the EQ program since its inception, with the most significant improvements coming in the form of a major program reconstitution effort in the late 1980s. The applicant also states that program documentation, including the EQ packages, has been maintained in the FNP master document and periodically updated.

Based on its review of the above operating experience and on discussions with the applicants technical staff, the project team concludes that FNP AMP B.3.7 adequately manages the aging effects that have been observed at the applicant's plant or at other nuclear power facilities.

7.1.5.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the EQ program in FNP LRA, Appendix A, Section A.3.1. The applicant states that the EQ program (FNP AMP B.3.7) manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the applicable license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.5.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. Since the GALL program is acceptable to the staff, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.6 STEAM GENERATOR PROGRAM (FNP AMP B.3.8)

In FNP LRA, Appendix B, Section B.3.8.2, the applicant states that FNP AMP B.3.8, "Steam Generator Program," is consistent with the GALL AMP XI.M19, "Steam Generator Tube Integrity."

7.1.6.1 Program Description

In the FNP LRA, the applicant states that the steam generator program is based on NEI 97-06, "Steam Generator Program Guidelines," which provides for detecting flaws in tubing and secondary side internals degradation. The applicant states that it uses the existing SG program to perform replacement SG surveillance in accordance with its technical specifications.

7.1.6.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.3.8 is consistent with the program described in the GALL AMP XI.M19.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.3.8, including FNP AMP master SRP-LR-AMP-10, "Steam Generator Program Master Document," dated October 31, 2003; FNP NMP-ES-004, "SNC Steam Generator Program (FNP, VEGP)," Version 1.0, effective September 26, 2003; FNP Technical Specification, Section 3.4.13, "RCS Operational Leakage," Amendment No. 147 (Unit 1) and Amendment No. 138 (Unit 2); FNP Technical Specification, Section 5.5.9, "Steam Generator (SG) Tube Surveillance Program," Amendment No. 147 (Unit 1) and Amendment No. 138 (Unit 2); and WCAP-12299, "Alloy 690 Tapered Mechanical Plug Summary Qualification Report," Rev. 1.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMP XI.M19 for consistency.

The project team performed a review of the applicable criteria in GALL AMP XI.M19, "Steam Generator Tube Integrity," and the program description and elements for the applicant's that FNP AMP B.3.8, "Steam Generator Program." Based on its review, the project team concludes that FNP AMP B.3.8 provides reasonable assurance for detecting flaws in tubing and secondary side internals degradation and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for the steam generator program, as discussed in GALL AMP XI.M19, "Steam Generator Tube Integrity."

7.1.6.3 Exceptions to the GALL Report

None

7.1.6.4 Enhancements to the GALL Report

None

7.1.6.5 Operating Experience

The applicant states, in the FNP LRA, that it recently replaced the original Westinghouse Model 51 SGs with Westinghouse Model 54F replacement SGs. The Unit 1 replacement SGs were installed in May 2000. The Unit 2 replacement SGs were installed in May 2001. No degradation of the replacement SGs has been detected.

The applicant also states that the Westinghouse Model 54F replacement SGs incorporate several improvements over the original Model 51 SGs, including thermally treated Alloy 690 tubes (A690TT). The applicant has not identified instances of cracking of A690TT tubes or sleeves at any U.S. plant. The only indications of any of A690TT tube degradation have been wear-related, either as a result of loose parts or at tube support structures.

The applicant states, in the FNP LRA, that it has voluntarily committed to implement an SG degradation management program based upon that described in NEI 97-06. The applicant will

update the SG program, as required, to incorporate changes to NEI 97-06 and the GALL Report recommended EPRI guidelines for SGs. The applicant also states that the SG degradation will also be evaluated against the structural integrity and leakage performance criteria of NEI 97-06.

The project team reviewed maintenance program records preceding the SG replacements and the results of the most recent SG structural integrity and leakage performance reports. On the basis of its review, the project team finds that the SG program identified component degradation prior to the loss of the intended function. The applicant's corrective action program resulted in the replacement of the SGs. The project team finds that the applicant continues to implement the requirements of the SG program.

Based on its review of the above operating experience and on discussions with the applicant's technical staff, the project team concludes that FNP AMP B.3.8 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.6.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the SG program in the FNP LRA, Appendix A, Section A.2.7, which states that the SG program used to perform replacement SG tube surveillance in accordance with the FNP technical specifications will be continued during the period of extended operation. The program will be based upon NEI 97-06 or its successors.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.6.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. Since the GALL program is acceptable to the staff, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.7 FLOW ACCELERATED CORROSION PROGRAM (FNP AMP B.4.1)

In the FNP LRA, Appendix B, Section B.4.1.2, the applicant states that FNP AMP B.4.1, "Flow Accelerated Corrosion Program," is consistent with GALL AMP XI.M17, "Flow Accelerated Corrosion Program," with an enhancement.

7.1.7.1 Program Description

In the FNP LRA, the applicant credits the FAC program 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. The applicant also states

that the FAC program activities include analysis to determine susceptible locations, baseline inspections of wall thickness, follow-up inspections, and predictive modeling techniques. These activities provide reasonable assurance that loss of material will be managed such that these systems will perform their intended function(s) during the period of extended operation.

7.1.7.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that the FNP AMP B.4.1 is consistent with GALL AMP XI.M17, with an enhancement. The applicant states that there are scope differences between the FNP AMP B.4.1 program scope and the GALL AMP XI.M17 program scope.

The applicant states, in the FNP LRA, that the GALL Report does not address the auxiliary feedwater (AFW) turbine exhaust piping, but does discuss SG feedwater and steam nozzle safe ends, components that FNP does not have. 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, which is significantly less susceptible to FAC. The project team requested the applicant to provide the material information for the feedwater inlet and main steam outlet nozzles. By letter dated August 19, 2004 (ML042390474), the applicant provides its supplemental information to the FNP LRA. In its response, the applicant states 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. This is the basis that 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 project team concludes that the applicant's determination, that the SG feedwater and main steam nozzles are not FAC susceptible, is consistent with the GALL Report and finds it acceptable.

The applicant also states, in the FNP LRA, that other than these scope differences, the FNP FAC program is consistent with that described in the GALL AMP XI.M17.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.4.1, including FNP AMP master FNP SP-LR-AMP-11, "Flow-Accelerated Corrosion Program Master Document," Rev. 0, SNC FAC-202L, "FAC Program Manual" and FNP-O-NDE-100.36, 6/1/01, "UT FAC Examination Procedure."

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMP XI.M17 for consistency.

The project team performed a review of the applicable criteria in GALL AMP XI.M17, "Flow Accelerated Corrosion Program," and the program description and elements for the applicant's FNP AMP B.4.1, "Flow Accelerated Corrosion Program."

For the aspects of the program elements that were determined by the applicant to be consistent with the corresponding program elements in GALL AMP XI.M17, the project team determined that these program elements for FNP AMP B.4.1 conform with the applicable, program elements and acceptance criteria in GALL AMP XI.M17, "Flow Accelerated Corrosion Program." Based on its review, the project team concludes that, with the enhancement identified by the applicant, the flow accelerated corrosion program provides reasonable assurance of aging management of

loss of material due to FAC for specific component/commodity groups in the auxiliary steam and condensate, feedwater, main steam, and SG blowdown systems, and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for flow accelerated corrosion program, as discussed in GALL AMP XI.M17, "Flow Accelerated Corrosion Program." The project team's evaluation of the enhancement identified by the applicant for the flow accelerated corrosion program is given in Section 7.1.7.4 of the report.

7.1.7.3 Exceptions to the GALL Report

None

7.1.7.4 Enhancements to the GALL Report

The applicant states, in the FNP LRA, that an enhancement to the GALL Report element is as follows

Element: 1: Scope of Program

Enhancement: The applicant will add the AFW pump turbine exhaust piping to the scope of the FAC program prior to the period of extended operation.

The project team concludes that this enhancement is required and is acceptable because the material of the auxiliary feedwater pump turbine exhaust piping exposed to a steam environment is susceptible to FAC.

By letter dated July 27, 2004 (ML042180163), the applicant added this enhancement to its license renewal future action commitments list (Item No. 1).

7.1.7.5 Operating Experience

The applicant states, in the FNP LRA, for the operating experience program element that operating experience shows that properly implemented FAC program is effective in managing FAC in high-energy carbon steel piping and components. The applicant states that NRC has consistently found that the applicant's program is effective in maintaining high-energy carbon steel piping within acceptable wall thickness limits in its inspection reports.

In the FNP LRA, the applicant also states that recent operating history was captured when the FNP Engineering Support Department evaluated the plant-specific FAC operating experience for the feedwater system against NRC 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." Through FNP Unit 1, refueling outage 17 (1R17) in Fall of 2001, 74 points in the Unit 1 feedwater system had been examined. Through FNP Unit 2 refueling outage 15 (2R15) in Fall of 2002, 82 points in the Unit 2 feedwater system had been examined. Based upon recent examinations, approximately eight components were scheduled for replacement on Unit 1 during refueling outage 18 (1R18), and approximately 25 feet of piping in the turbine building and one component in the main steam valve room have been recommended for replacement on Unit 2 during refueling outage 16 (2R16).

Based on its review of FNP AMP master document, results of inspections, and implementing procedure, the project team concludes that the FNP AMP B.4.1 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.7.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the FAC program in FNP LRA, Appendix A, Section A.2.8. The applicant states that the FAC program activities include analysis to determine susceptible locations, baseline inspections of wall thickness, follow-up inspections, and predictive modeling techniques. These activities will provide reasonable assurance that systems will perform their intended safety function(s) during the period of extended operation. The 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.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.7.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the enhancement to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.8 FUEL OIL CHEMISTRY CONTROL PROGRAM (FNP AMP B.4.2)

In FNP LRA, Appendix B, Section B.4.2.2, the applicant states that FNP AMP B.4.2, "Fuel Oil Chemistry Control Program," is consistent with GALL AMP XI.M.30, "Fuel Oil Chemistry", with an exception and an enhancement.

7.1.8.1 Program Description

In the FNP LRA, the applicant states that the fuel oil chemistry program is governed by its technical specifications. The technical specifications include surveillance and maintenance procedures to mitigate corrosion as well as measures to verify the effectiveness of the fuel oil chemistry control program and confirm the absence of an aging effect.

The applicant states, in the FNP LRA, that the fuel oil chemistry control program manages loss of material from the emergency diesel fuel oil system components. The applicant also states that FNP minimizes exposure to fuel oil contaminants, such as water and microbiological organisms, by verifying the quality of new oil before its introduction into the storage tanks. Fuel oil quality is maintained by monitoring and controlling fuel oil contamination in accordance with

the guidelines contained in selected American Society for Testing Materials (ASTM) Standards. Chemical treatment is used to stabilize the fuel oil.

7.1.8.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.4.2 is consistent with the GALL AMP XI.M30, with an exception and an enhancement.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.4.2, including FNP AMP master document SP-LR-AMP-12, "Fuel Oil Chemistry Control Program Master Document," which provides an assessment of the AMP's elements' of consistency with GALL AMP XI.M30.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMP XI.M19 for consistency.

The project team performed a review of the applicable criteria in GALL AMP XI.M.30, "Fuel Oil Chemistry", and the program description and elements for the applicant's FNP AMP B.4.2, "Fuel Oil Chemistry Control Program."

For the aspects of the program elements that were determined by the applicant to be consistent with the corresponding program elements in GALL AMP XI.M.30, the project team determined that these program elements for the applicant's FNP AMP B.4.2 conform with the applicable, program elements and acceptance criteria in GALL AMP XI.M.30, "Fuel Oil Chemistry". Based on its review, the project team concludes that, with the exception of the deviations and the enhancement identified by the applicant, FNP AMP B.4.2 provides reasonable assurance of aging management of loss of material from the emergency diesel fuel oil system components and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for the fuel oil chemistry control program, as discussed in GALL AMP XI.M.30, "Fuel Oil Chemistry." The project team's evaluation of the deviation and enhancement identified by the applicant for the fuel oil chemistry control program is given in Sections 7.1.8.3 and 7.1.8.4 of this report, respectively.

7.1.8.3 Exceptions to the GALL Report

The applicant states, in the FNP LRA, that exception to the GALL Report elements is as follows

Elements: 3: Parameters Monitored/Inspected
6: Acceptance Criteria

Exception: Specific ASTM Standards that the applicant uses as guidelines for sampling and sample analysis are governed by the FNP's technical specifications.

The GALL Report identifies the following criteria for the "parameters monitored/inspected", and acceptance criteria program element associated with the exception taken:

> The ASTM D 4057-95(2000), "Standard Practice for Manual Sampling of Petroleum and Petroleum Products," is used for guidance on oil sampling. The

> ASTM D 1796-97, “Standard Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method”, and ASTM D 2709-96, “Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge,” are used for determination of water and sediment contamination in diesel fuel.

In the FNP LRA, the applicant states that it uses ASTM D270-75 to perform fuel oil sampling and sample analysis in accordance with its technical specifications. Section XI.M30 of the GALL Report prescribes ASTM D4057. The applicant performed a comparison of the standards cited in the plant technical specifications 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 states, in the FNP LRA, that since 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 also states that operating experience confirms that the fuel oil chemistry program has been effective in managing aging.

The project team reviewed the exception concerning the ASTM standards, which the applicant uses in accordance with technical specification Section 5.5.13. The applicant tests for water and sediments, kinematic viscosity, insolubles and bacteria and fungi. The applicant does not test for particulates as required by the GALL Report. Since sediments are a good indicator of particulates and the standards and criteria used by the applicant are consistent with the technical specification requirements that are part of the CLB, which take precedence over the GALL Report, the project team finds that this exception is acceptable.

7.1.8.4 Enhancements to the GALL Report

The applicant states, in the FNP LRA, that an enhancement to the GALL Report element is as follows

> Element: 1: Scope of Program
>
> Enhancement: The applicant will evaluate the scope of the program, 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 prior to the period of extended operation.

The GALL Report identifies the following criterion for the scope of program element associated with the enhancement:

> The specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.

The project team finds this enhancement is required and is acceptable as any such changes will provide additional assurance that the effects of aging will be adequately managed.

By letter dated July 27, 2004 (ML042180163), the applicant added this enhancement to its license renewal future action commitments list (Item No. 2).

7.1.8.5 Operating Experience

The project team reviewed the operating experience described in the FNP AMP master document SP-LR-AMP-12. 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, these instances were isolated rather than systemic, and were not indicative of programmatic failure. Interviews with the applicant staff confirmed that the applicant cleaned and performed visual inspections of several EDG fuel oil storage tanks. The overall condition of the tanks was satisfactory, no significant degradation was noted.

Based on its review of the operating experience and on discussion with the applicant's technical staff, the project team concludes that FNP AMP B.4.2 adequately manages the aging effect that has been observed at the applicant's plant.

7.1.8.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the fuel oil chemistry control program in FNP LRA, Appendix A, Section A.2.9. The applicant states that it will continue to include surveillance and maintenance procedures to mitigate corrosion as well as measures to verify the effectiveness of this aging management program and confirm the absence of an aging effect. The exception and the enhancement are specifically identified in the Appendix A.2.9 summary.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.8.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the exception and the enhancement to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.9 STRUCTURAL MONITORING PROGRAM (FNP AMP B.4.3)

In FNP LRA, Appendix B, Section B.4.3.2, the applicant states that the FNP AMP B.4.3, "Structural Monitoring Program," is consistent with GALL AMP XI.S5, "Masonry Wall Program," and GALL AMP XI.S6, "Structures Monitoring Program," with enhancements.

However, GALL AMP XI.S6 states structures monitoring programs are plant-specific, therefore the FNP structural monitoring program is presented in the plant-specific program format.

7.1.9.1 Review of the AMP Against the Program Elements

The project team reviewed FNP AMP B.4.3 against the AMP elements found in the SRP-LR, Appendix A, Section A.1.2.3 and SRP-LR Table A.1-1. In addition, the project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.4.3, including FNP AMP master document SP-LR-AMP-13, "Structural Monitoring Program Master Document." The guidance described in the FNP audit and review plan was followed.

7.1.9.1.1 Scope of Program

The applicant states in FNP AMP B.4.3, for the "scope of program" program element, that the program includes in-scope structure and support components in 15 different structures. These are: containment; auxiliary building; service water intake structure; diesel generator building; low voltage switchyard; fire protection pump house; switch house; turbine building; high voltage switchyard; valve and pull boxes; foundations, retaining walls and supports for the refueling water storage tank (RWST), fire water tank, fire protection fuel oil tank, diesel fuel oil storage tank, and CST (tanks themselves are covered under other programs); utility/piping tunnels; vent stack; low level radwaste storage building; and solidification/de-watering facility.

The applicant states further that the program scope will be enhanced to include additional structures and components during the period of extended operation which are in-scope for license renewal but are not currently monitored under the program. These additional structures and components include: submerged portions of the service water intake structure; 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/de-watering building (e.g., fire protection). An enhancement will also be made to the structural monitoring program document to clarify which hangers and supports are to be inspected in Category 1 buildings.

The scope of program element criterion in Appendix A.1 of the SRP-LR is that the program should include the specific structures and components of which the program manages the aging.

The project team finds that the enhancements to include (1) additional structures and components during the period of extended operation which are in-scope for license renewal but are not currently monitored under the program and (2) clarification to the structural monitoring program documentation to identify the hangers and supports to be inspected in Category 1 buildings is required and is acceptable on the basis that these components require aging management per 10 CFR 54.4.

By letter dated July 27, 2004 (ML042180163), the applicant added the above enhancements to its license renewal future action commitments list (Item No. 3).

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1 of the SRP-LR. The proposed scope, including the enhancements, identifies the specific components for which the program manages aging. On this basis, the project team finds that the applicant's proposed program scope is acceptable.

7.1.9.1.2 Preventive Actions

The applicant states in FNP AMP B.4.3, for the “preventive actions” program element, that the preventive actions program element is not applicable because the structural monitoring program is composed of condition monitoring activities. There are no preventive actions credited for the period of extended operation.

The criterion for this program element in Appendix A.1 of the SRP-LR is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1 of the SRP-LR. The project team did not identify the need for preventive actions for AMP B.4.3 because it is a condition monitoring program.

7.1.9.1.3 Parameters Monitored/Inspected

The applicant states in FNP AMP B.4.3, for the “parameters monitored or inspected” program element, that concrete structures are inspected for cracking, spalling, radiation/temperature damage, signs of leaching, weathering, and settlement. Masonry block walls are inspected for cracking and settlement. Steel structures and components are inspected for corrosion, cracked welds, deformation, degradation of grout, and anchorages. Seismic gaps are inspected for deterioration and proper gap.

The criterion for this program element in Appendix A.1 of the SRP-LR is

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structures and components (SC) intended function(s).

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The structural monitoring program identified SCs and linked the aging effects to the structures and components that are intended to detect the presence and extent of aging effects. On this basis, the project team finds that the parameters monitored or inspected program element is acceptable.

7.1.9.1.4 Detection of Aging Effects

The applicant states in FNP AMP B.4.3, for the “detection of aging effects” program element, that the structural monitoring program inspection process assesses the ongoing, overall conditions of the buildings and structures, and identifies any ongoing degradation. Structural condition is assessed through visual inspection. Inspections include those normally accessible buildings and structures, including accessible portions that are below ground or embedded. When normally inaccessible portions of structures are exposed because of excavation or modification, the applicant will perform an examination of the exposed surfaces.

The applicant also states, in the FNP LRA, that structures are monitored for changes in previously identified findings and for newly developed conditions. Trending of such findings is performed to predict degrading conditions and to determine the potential long-term impact. The inspection frequency for plant structures varies according to site conditions and susceptibility to

aging degradation. Structures monitored under the provisions of 10 CFR 50.65(a)(2) are inspected at regular intervals unless the conditions, environment, or noted degradation warrants changes to the inspection frequency. For portions of buildings and structures that are normally inaccessible due to physical obstruction or that are below grade, the applicant will perform inspections whenever these areas are excavated or exposed.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> This program element describes when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program).
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience.
>
> When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The inspections use methods, frequency, and sample size based on existing codes and operating experience to detect the presence and extent of aging effects. On that basis, the project team finds that the detection of aging effects program element is acceptable.

7.1.9.1.5 Monitoring and Trending

The applicant states in FNP AMP B.4.3, for the “monitoring and trending” program element, that initial inspections (baseline) were conducted to facilitate condition trending. The structural monitoring program reports indicate that baseline inspections were conducted during the period of June 1996 through August 1997 for the structures and structural components described in the structural monitoring program document. The primary purposes of the baseline inspections was to look for signs of active degradation mechanisms, to provide an initial assessment of their significance, and to establish a reference baseline (in time) for comparison to future inspection results.

In addition, the applicant states, in the FNP LRA, that structures are monitored for changes from previously identified findings and for newly developed conditions. Trending of such findings is performed to predict degrading conditions and to determine the potential long-term impact. Periodic inspections commenced in April 2000 and are planned every five years for the duration of plant operation. Also, this frequency is subject to modification based on plant-specific environments or observed degradation. Such observations may dictate that an increased or decreased inspection rate for a particular structure or structural component.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.
>
> This program element describes how the data collected are evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team concludes that trending of the inspection results will enhance the applicant's ability to detect aging effects before there is a loss of intended function. On this basis, the project team finds that the monitoring and trending program element is acceptable.

7.1.9.1.6 Acceptance Criteria

The applicant states in FNP AMP B.4.3, for the "acceptance criteria" program element, that acceptance criteria for inspection and criteria for categorizing the overall structural and component conditions (i.e., acceptable, acceptable with deficiency, or unacceptable) are provided in plant procedures. These acceptance criteria are consistent with the recommended criteria in American Concrete Institute (ACI) ACI-349.3R-96, "Code Requirement for Nuclear Safety-Related Concrete Structures," but also include additional criteria for roofing, water leakage, coatings, and penetration seals. The results of these inspections are evaluated in accordance with the guidance given in NEI-96-03 and RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Rev. 2.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation.
>
> The program should include a methodology for analyzing the results against applicable acceptance criteria.
>
> Qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site specific programs.

The project team reviewed and confirmed that the acceptance criteria program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team confirms that the applicant has provided the basis for the acceptance criteria and the methodology for evaluating inspections results. The project team finds that any degradation that could lead to loss of function will be found unacceptable and corrective measures implemented. On this basis, the project team finds that the acceptance criteria program element is acceptable.

7.1.9.1.7 Corrective Actions

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.9.1.8 Confirmation Process

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.9.1.9 Administrative Controls

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.9.1.10 Operating Experience

The applicant states in FNP AMP B.4.3 that a formal operating experience program is in place and 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 indicates, in the FNP LRA, that the 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 that were conducted during the first five-year period included all accessible areas in the scope of the structural monitoring program. The operating experience review concluded that administrative controls are in effect and are effective in identifying age related degradation and initiating corrective action.

The operating experience program element criterion in Appendix A.1 of the SRP-LR states that operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the SC intended function(s) will be maintained during the period of extended operation.

The project team reviewed the applicant's Operating Experience Evaluation Program, Administrative Procedure, FNP-0-AP-65 and based its review and on discussions with the applicants technical staff, the project team concludes that FNP AMP 4.3 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.9.2 UFSAR Supplement

The applicant provides its UFSAR supplement for the structural monitoring program in FNP LRA, Appendix A, Section A.2.10. The applicant states that its structural monitoring program is based upon the requirements and guidance set forth in 10 CFR 50.65 and RG 1.160. In addition, the applicant will continue to use this program to monitor the condition of structures and structural components within the scope of the Maintenance Rule, thereby providing reasonable assurance that there is no loss of structure or structural component intended function during the period of extended operation.

The applicant states that the structural monitoring program also included the masonry wall considerations identified in NRC IE Bulletin 80-11, "Pressurizer Surge Line Thermal Stratification" and IN 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11." The applicant will implement enhancements to the structural monitoring program to include (1) provisions to monitor structures and components during the period of extended operation which are in scope for license renewal but are not currently monitored under the program and (2) clarification to the structural monitoring program documentation to identify the hangers and supports to be inspected in Category 1 buildings through the use of administrative controls and procedures. These enhancements are identified in Section 7.1.9.1.1 above are listed in the UFSAR supplement.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.9.3 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the enhancements to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.10 SERVICE WATER PROGRAM (FNP AMP B.4.4)

In FNP LRA Appendix B, Section B.4.4.2, the applicant states that FNP AMP B.4.4, "Service Water Program," is consistent with GALL AMP XI.M20, "Open Cycle Cooling Water System," with an enhancement.

7.1.10.1 Program Description

In the FNP LRA, the applicant states that its service water program activities implement the recommendations of Generic Letter (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 also states, in the FNP LRA, that prevention or mitigation of fouling and loss of material in the SW system and components is accomplished, in part, by intermittent injection of 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. Some components are visually inspected for fouling or loss of material.

7.1.10.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.4.4 is consistent with the GALL AMP XI.M20, with enhancement.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.4.4, including FNP AMP master document FNP SP-LR-AMP-14, "Service Water Program Master Document," which provides an assessment of the AMP's elements' of consistency with GALL AMP XI.M20. In addition, the project team also reviewed the applicant's service water plan, the applicant's docketed response to GL 83-13, and the applicant operating experience report.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against the GALL AMP XI.M20 for consistency.

The project team performed a review of the applicable criteria in GALL AMP XI.M20, "Open Cycle Cooling Water System," and the program description and elements for the applicant's FNP AMP B.4.4, "Service Water Program."

For the aspects of the program elements that were determined by the applicant to be consistent with the corresponding program elements in GALL AMP XI.M20, the project team determined that these program elements for the applicant's FNP AMP B.4.4 conform with the applicable, program elements and acceptance criteria in GALL AMP XI.M20, "Open Cycle Cooling Water System." Based on its review, the project team concludes that, with the enhancement identified by the applicant, the applicant's service water program provides reasonable assurance of aging management of fouling and loss of material in the service water (SW) system and associated components and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for service water program, as discussed in GALL AMP XI.M20, "Open Cycle Cooling Water System." The project team's evaluation of the enhancement identified by the applicant for the service water program is given in Section 7.1.10.4 of the report.

7.1.10.3 Exceptions to the GALL Report

None

7.1.10.4 Enhancements to the GALL Report

The applicant states, in the FNP LRA, an enhancement to the GALL Report elements as follows

Element: 1: Scope of Program

Enhancement: The scope of the service water program will be enhanced prior to the extended period of operation to include inspection of piping from the main SW header to the air compressor credited for 10 CFR 50, Appendix R, safe shutdown, and the service water pump columns.

The GALL Report identifies the following criterion for the "scope of program" program element associated with the enhancement:

> The specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.

The project team finds that these components require aging management per 10 CFR 54.4, therefore, this enhancement is required and is acceptable.

By letter dated July 27, 2004 (ML042180163), the applicant added this enhancement to its license renewal future action commitments list (Item No. 4).

7.1.10.5 Operating Experience

The applicant states, in the FNP 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. Corrective actions were taken. 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. Evidence of microbiologically influenced corrosion (MIC) continues to be found without severe problems or loss of intended function.

The project team reviewed the applicant's operating experience report, which includes specific operating experience for the service water program. The operating experience includes biofouling and loss of material issues and that these were documented and corrected by the applicant. The project team noted that implementation of GL 89-13 at the applicant's site 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 and on discussions with the applicants technical staff, the project team concludes that service water program adequately manages the aging effects that have been observed at the applicant's plant.

7.1.10.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the service water program in FNP LRA, Appendix A, Section A.2.11, which states that the service water program activities implement the recommendations of GL 89-13. Mitigation, as well as performance and condition monitoring techniques are used to manage fouling and loss of material in the SW system and components it serves. Collectively, these activities provide reasonable assurance that the SW system will perform its intended safety function(s) during the period of extended operation.

The applicant states that the scope of the service water program will be enhanced prior to the extended period of operation to include inspection of piping from the main service water header to the air compressor credited for Appendix R, safe shutdown, and the service water pump columns.

The project team reviewed the UFSAR supplement and finds that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.10.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the enhancement to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.11 FIRE PROTECTION PROGRAM (FNP AMP B.4.5)

In FNP LRA Appendix B, Section B.4.5.2, the applicant states that FNP AMP B.4.5, "Fire Protection Program," is consistent with GALL AMP XI.M26, "Fire Protection Program," and GALL AMP XI.M27, "Fire Water System Program," with enhancements.

7.1.11.1 Program Description

In the FNP LRA, the applicant states that its 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 fire protection program will detect loss of material, fouling, cracking, and change in material properties (carbon dioxide (CO_2) tank insulation) in the applicable fire protection components.

The applicant also states, in the FNP LRA, that it will perform visual inspections and/or performance testing and monitoring on fire protection components requiring aging management during the period of extended operation. For example, fire pump diesels will be periodically performance tested and fire doors will be inspected to ensure their operability is maintained.

The applicant states, in the FNP LRA, that for aging management during the period of extended operation of structural fire barriers, including fire walls, floors, ceilings, structural portions of fire penetration seals, and fire door frames, the applicant will perform inspection via the structural monitoring program (FNP AMP B.4.3) separately from the fire protection program.

In addition, the applicant states, in the FNP LRA, that it will test and verify the fire pump diesel fuel oil quality via the fuel oil chemistry control program (FNP AMP B.4.2).

7.1.11.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.4.5 is consistent with GALL AMPs XI.M26 and XI.M27, with enhancements.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.4.5, including FNP AMP master document FNP SP-LR-AMP-15, "Fire Protection Program Master Document," FNP-1-FSP-65.2, "FNP Fire Surveillance Procedure - Fire Door Inspection," Version 2.0, and FNP-1-FSP-405, "FNP Fire Surveillance Procedure - Preaction Sprinkler System (Annual)," Version 11.0.

The project team also reviewed seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documentation against GALL AMPs XI.M26 and XI.M27 for consistency.

The applicant states, in the FNP LRA, that the changes to the NRC's license renewal guidance for GALL AMPs XI.M26 and XI.M27 that are presented in the NRC ISG-04, "Aging Management of Fire Protection Systems for License Renewal," have been incorporated into the respective program elements for the fire protection program.

During its review of the basis documents, the project team identified two additional differences between FNP LRA AMP B.4.5 and GALL AMPs XI.M26 and XI.M27. These two differences are discussed below.

In the "parameters monitored or inspected" program element, the applicant states that CO_2 and halon inspections are performed every 18 months. The criterion for this program element in GALL AMP XI.M26 states that periodic visual inspections and function tests will be performed at least once every six months to detect signs of degradation in the halon/CO_2 fire suppression system.

In the "detection of aging effects" program element, the applicant states that (1) CO_2 and halon inspections are performed every 18 months, and that (2) yard hydrant visual inspections are performed annually. The criteria for this program element in GALL AMPs XI.M26 and XI.M27 state that (1) periodic visual inspections and function tests will be performed at least once every six months to detect signs of degradation in the halon/CO_2 fire suppression system, and (2) visual inspections of yard fire hydrants will be performed once every six months to ensure timely detection of signs of degradation, such as corrosion.

The applicant further states, in the FNP LRA, that it considers the GALL inspections as supplements to the routine fire protection inspections required by the NRC-accepted FNP fire protection plan.

On the basis of its review, the project team finds that these aging effects act over a considerable period of time, and that the 18 months inspection interval is sufficient to detect aging of CO_2, halon, and fire doors. Also, the project team finds that the annual visual inspections of yard hydrants is sufficient to ensure timely detection of signs of degradation.

The project team also performed a review of the applicable criteria in GALL AMP XI.M26, "Fire Protection Program" and GALL AMP XI.M27, "Fire Water System Program," and the program description and elements for FNP AMP B.4.5, "Fire Protection Program."

For the aspects of the program elements that were determined by the applicant to be consistent with the corresponding program elements in GALL AMPs XI.M26 and XI.M27, the project team determined that these program elements for FNP AMP B.4.5 conform with the applicable, program elements and acceptance criteria in GALL AMP XI.M26, "Fire Protection Program" and

GALL AMP XI.M27, "Fire Water System Program." Based on its review, the project team concludes that, with the enhancements identified by the applicant, the applicant's fire protection program provides reasonable assurance of aging management loss of material, fouling, cracking, and change in material properties (carbon dioxide (CO_2) tank insulation) in the applicable fire protection components and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for the fire protection program, as discussed in GALL AMP XI.M26, "Fire Protection Program" and GALL AMP XI.M27, "Fire Water System Program." The project team's evaluation of the enhancements identified by the applicant for the fire protection program is given in Section 7.1.11.4 of the report.

7.1.11.3 Exceptions to the GALL Report

None

7.1.11.4 Enhancements to the GALL Report

The applicant states, in the FNP LRA, that the enhancements to the GALL Report elements as follows

Elements: 1: Scope of Program
4: Detection of Aging Effects

Enhancement: (1) 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.

(2) 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 ten 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 five-year intervals will be formalized in fire protection procedures.

The GALL Report identifies the following criteria for the "scope of program" and "detection of aging effects" program elements associated with the enhancements:

> The aging management program focuses on managing loss of material due to corrosion, MIC, or biofouling of carbon steel and cast-iron components in fire protection systems exposed to water.
>
> Sprinkler systems are inspected once every refueling outage to ensure that signs of degradation, such as corrosion, are detected in a timely manner.

The project team finds 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.

Also, ISG-04 revised criteria for the GALL AMP XI.M27 parameters monitored/inspected program element to no longer recommend 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, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," Chapter 13, Annexes A and D, 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 project team finds enhancement (1) required and acceptable.

In addition, 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 extended period of operation to ensure that signs of degradation are detected in a timely manner. Based on the revised GALL criteria in ISG-04 and the applicant's commitment to rely upon applicable codes and standards to develop test procedures, the project team finds enhancements (2) - (4) required and acceptable.

By letter dated July 27, 2004 (ML042180163), the applicant added these enhancements to its license renewal future action commitments list (Item No. 5).

7.1.11.5 Operating Experience

The applicant states, in the FNP LRA that, since the inception of the fire protection program, ongoing internal and external assessments have been performed, including NRC triennial inspections. These assessments have been effective in identifying programmatic strengths and weaknesses and in prompting corrective actions. Inspections, performance testing, and performance monitoring per the existing fire protection program have been effective in managing age-related degradation such that corrective actions are taken well before a loss of intended function could occur.

The applicant states, in the FNP LRA, that specific operating experience indicates that there have been occasions where loss of material occurred along the bottom of specific sections of normally dry fire protection piping. Interviews indicated that this was attributed to drainage problems associated with operational or design/installation practice, and corrective actions have been taken to prevent recurrence.

With regard to the CO_2 system, the applicant states, in the FNP LRA, that a review was conducted which covered approximately 15 years of operation. The results indicated very few age related instances requiring maintenance. Most of the item involved replacement of bulbs, valve seals, rubber seats, and pilot valve seat discs.

Based on its review of the above operating experience and on discussions with the applicant's technical staff, the project team concludes that FNP AMP B.4.5 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.11.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the fire protection program in FNP LRA, Appendix A, Section A.2.12. The applicant states that the fire protection program will provide inspections, performance testing, 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 will implement enhancements to the fire protection program prior to entering the extended period of operation through the use of administrative controls and procedures. The enhancements identified in Section 7.1.11.4 above are listed in the UFSAR supplement.

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.11.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the enhancements to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.12 EXTERNAL SURFACES MONITORING PROGRAM (FNP AMP B.5.3)

In the FNP LRA Appendix B, Section B.5.3.2, the applicant describes FNP AMP B.5.3, "External Surfaces Monitoring Program."

The applicant states that FNP AMP B.5.3 is a new plant-specific program. The applicant credits this program for managing the loss of material from the external surfaces of components included within the scope of license renewal.

7.1.12.1 Review of the AMP Against the Program Elements

The project team reviewed FNP AMP B.5.3 against the AMP elements found in the SRP-LR, Appendix A, Section A.1.2.3 and SRP-LR Table A.1-1. In addition, the project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.5.3, including FNP AMP master document FNP SP-LR-AMP-18, "External Surfaces Monitoring Program Master Document." The guidance described in the FNP audit and review plan was followed.

7.1.12.1.1 Scope of Program

The applicant states in FNP AMP B.5.3, for the “scope of program” program element, that the new plant-specific 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 in inside and outside environments, and galvanized steel, cast iron, copper alloys, and aluminum surfaces in outside environments.

In the FNP LRA, the applicant states that the external surfaces monitoring program is credited for managing loss of material in the external surfaces of specific component/commodity groups in the following FNP LRA systems: closed cooling water systems; spent fuel pool cooling and cleanup; main steam; auxiliary and radwaste area ventilation; demineralized water system; auxiliary feedwater; compressed air system; containment isolation system; control room area ventilation; diesel fuel oil; emergency diesel generator; fire protection; containment spray; emergency core cooling systems; hydrogen control system; liquid waste and drains; open cycle cooling water; potable and sanitary water; primary containment; hvac sample system; oil-static cable pressurization system; electrical components; yard structures HVAC; chemical and volume control system; and reactor makeup water storage.

The applicant also states, in the FNP LRA, that the external surfaces monitoring program will also manage the loss of material, cracking, and change of material properties in elastomer flexible hoses used in the oil-static cable pressurization system.

This program element criterion in Appendix A.1 of the SRP-LR states that the scope of the program should include the specific structures and components of which the program manages the aging.

The project team reviewed and confirmed that this satisfies the criterion defined in Appendix A.1 of the SRP-LR. The proposed scope identifies the specific components for which the program manages aging. On this basis, the project team finds that the applicant’s proposed program scope is acceptable.

7.1.12.1.2 Preventive Actions

The applicant states in FNP AMP B.5.3, for the “preventive action” program element, that FNP external surfaces monitoring activities will include actions to monitor and report conditions. There will be no preventive actions credited for these activities.

This program element criterion in Appendix A.1 of the SRP-LR is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1 of the SRP-LR. The project team did not identify the need for preventive actions for FNP AMP B.5.3 because it is a condition monitoring program.

7.1.12.1.3 Parameters Monitored/Inspected

The applicant states in FNP AMP B.5.3, for the “parameters monitored/inspected” program element, that the program surface conditions of selected equipment and components will be monitored by plant personnel for signs of corrosion or wear. Periodic inspections of accessible

portions of piping and tubing will be performed to detect signs of loss of material, flange leakage, missing or damaged insulation, damaged coatings, and fretting of tubing. Inspections of insulated surfaces will be on a sampling basis and target areas identified by baseline documentation and operating experience as most susceptible. Accessible in-scope polymers or elastomers will also be inspected for age-related degradation.

The criterion for this program element in Appendix A.1 of the SRP-LR is

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s).

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The external surfaces monitoring program identified SCs and linked the aging effects to the structures and components that are intended to detect the presence and extent of aging effects. On this basis, the project team finds that the parameters monitored or inspected program element is acceptable.

7.1.12.1.4 Detection of Aging Effects

The applicant states in FNP AMP B.5.3, for the "detection of aging effects" program element, that visual inspections will be conducted, typically by walkdowns intended to be performed such that at a minimum, all accessible (non-insulated) portions of a system are observed on a regular basis.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> This program element describes when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program).
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience.
>
> When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

During the audit, the project team recognizes that visual examination is an appropriate method to detect corrosion, but cannot be used in isolation to quantify corrosion. When questioned this approach, the applicant stated that if visual examination detects corrosion, supplemental examination methods, i.e., surface or volumetric, would then be used to quantify the degree of corrosion. The project team finds that the use of visual inspection to observe surface condition is an acceptable means to detect corrosion and age-related degradation.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team finds that the inspections use methods that

are acceptable to detect the presence and extent of aging effects. On that basis, the project team finds that the detection of aging effects program element is acceptable.

7.1.12.1.5 Monitoring and Trending

The applicant states in FNP AMP B.5.3, for the "monitoring and trending" program element, that baseline documentation for the condition of the managed external surfaces will be established prior to the beginning of the extended period of operation. The baseline information may be established through compilation of existing information already contained in the condition report database, engineering support records, or other records. If a satisfactory representative baseline cannot be established using existing information, then additional special inspections will be performed prior to the beginning of the extended period of operation.

The application also states, in the FNP LRA, that degradation of external surfaces will be monitored and trended in accordance with established procedures and guidelines. The frequency of inspection is subject to modification based on plant specific environments or observed degradation. Such observations may dictate that an increased or decreased inspection rate would be prudent for a particular system, component, or area. Repetitive failures will be addressed by reviewing the inspection results and task content, and frequency will be adjusted as necessary to preclude component failures.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.
>
> Program element should be described - how the data collected are evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team finds that trending of the inspection results will enhance the applicant's ability to detect aging effects before there is a loss of intended function. On this basis, the project team finds that the monitoring and trending program element is acceptable.

7.1.12.1.6 Acceptance Criteria

The applicant states in FNP AMP B.5.3, for the "acceptance criteria" program element, that the program will be contained in the applicable inspection or examination procedures. These criteria will be directly correlated to the indications of aging effects requiring management.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The program should include a methodology for analyzing the results against applicable acceptance criteria.

Qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site-specific programs.

During the audit, the project team recognizes that valid acceptance criteria for visual examination could exist for the detection of corrosion or age-related degradation, but not for the quantification of corrosion or age-related degradation. When the project team asked the applicant about how corrosion or age-related degradation would be quantified, the applicant stated that the visual acceptance criteria will be very conservative and will accept only normal surface conditions; any surface condition that is not normal will be selected for supplemental examination, i.e., surface or volumetric, to quantify material loss or other age-related degradation.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team finds that any degradation that could lead to loss of function will be found unacceptable and corrective measures implemented. On this basis, the project team finds that the acceptance criteria program element is acceptable.

7.1.12.1.7 Corrective Actions

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.12.1.8 Confirmation Process

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.12.1.9 Administrative Controls

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.12.1.10 Operating Experience

In Section B.5.3.13 of the FNP LRA, the applicant states that there is no programmatic operating experience for this program. There do exist 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 aging management program.

This program element criterion in Appendix A.1 of the SRP-LR states that operating experience should provide objective evidence to support the conclusion that the effects of aging will be adequately managed so that the SC intended function(s) will be maintained during the period of extended operation.

The project team recognizes that the corrective action program, which captures internal and external plant operating experience issues, will provide reasonable assurance 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.

7.1.12.2 UFSAR Supplement

The applicant provides its UFSAR supplement for the external surfaces monitoring program in FNP LRA, Appendix A, Section A.2.15. The applicant states that the external surfaces monitoring program will be a new plant-specific condition monitoring program that will be implemented prior to entering the period of extended operation. It will include periodic visual inspections of external surfaces of carbon steel, low-alloy steel, and other susceptible materials in components requiring aging management for license renewal.

The applicant states that plant procedures and administrative controls will be developed to provide for surface condition monitoring of selected equipment and components for signs of corrosion or wear. Periodic inspections of accessible portions of piping and tubing will be performed to detect signs of loss of material, flange leakage, missing or damaged insulation, damaged coatings, and fretting of tubing.

The applicant also states that accessible in-scope polymers or elastomers will also be inspected for age-related degradation. Susceptible materials or components will include accessible fasteners, ventilation system seals and collars, other polymers and elastomers, copper, and aluminum and coated steel structural components which are not within the scope of the structural monitoring program.

By letter dated July 27, 2004 (ML042180163), the applicant states that it will implement this program prior to entering the period of extended operation. The applicant added this commitment to its license renewal future action commitments list (Item No. 8).

The project team reviewed the UFSAR supplement and finds that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.12.3 Conclusion

On the basis of its audit and review of the applicant's program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.13 BURIED PIPING AND TANK INSPECTION PROGRAM (FNP AMP B.5.4)

In FNP LRA, Appendix B, Section B.5.4, the applicant states that FNP AMP B.5.4, "Buried Piping and Tank Inspection Program," is a new program that will be initiated prior to the period of extended operation. The applicant states that the FNP AMP will be consistent with GALL

AMP XI.M34, “Buried Piping and Tanks Inspection.” By letter dated April 7, 2004 (ML041050600), the applicant updated its FNP AMP B.5.4 to be consistent with GALL AMP XI.M34 with exception.

7.1.13.1 Program Description

In the FNP LRA and in its April 7, 2004 letter (ML041050600), the applicant states that the buried piping and tank inspection program will be used to manage 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. 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. The applicant will implement this new program prior to the period of extended operation.

7.1.13.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.5.4 will be consistent with GALL AMP XI.M34. By letter dated April 7, 2004 (ML041050600), the applicant updated its FNP AMP B.5.4 to be consistent with GALL AMP XI.M34 with exception.

The project team reviewed FNP AMP master document SP-LR-AMP-19, “FNP Buried Piping and Tank Inspection Program,” “FNP Maintenance Procedure Coating, Wrapping and Surface Testing of Underground Pipe,” “Corrective Action Program,” and “Condition Reporting Generic Information and Preparation and Processing of Licensee Event Reports,” and interviewed the applicant's technical staff. This AMP relies on the detection of leaks, and on preventive measures such as coating and wrappings and periodic inspections to manage the effects of the loss of material on the external surfaces of buried piping and tanks. Periodic inspections are performed when leaks are detected, and the location is excavated for repair and upgrade.

The project team also reviewed the seven program elements (see Section 5.1 of this report) contained in the FNP AMP and associated bases documents against GALL AMP XI.M34 for consistency.

For the aspects of the program elements that were determined by the applicant to be consistent with the corresponding program elements in GALL AMP XI.M34, “Buried Piping and Tanks Inspection,” the project team determined that these program elements for FNP AMP B.5.4, “Buried Piping and Tank Inspection Program,” conform with the applicable, program elements and acceptance criteria in GALL AMP XI.M34. Based on its review, the project team concludes that, with the exception identified by the applicant, the applicant’s buried piping and tanks inspection program provides reasonable assurance of aging management 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 because the AMP conforms to the recommended program description, program elements, and acceptance criteria for the buried piping and tanks inspection program, as discussed in GALL AMP XI.M34, “Buried Piping and Tanks Inspection.” The project team’s evaluation of the exception identified by the applicant for the buried piping and tank inspection program is given in Section 7.1.13.3 of this report.

7.1.13.3 Exceptions to the GALL Report

The applicant states, in its April 7, 2004 (ML041050600), exceptions to the GALL Report elements as follows

Elements: 1: Scope of Program
3: Parameters Monitored/Inspected
4: Detection of Aging Effects
5: Acceptance Criteria

Exception: The applicant's program will include provisions for inspection of buried stainless steel and copper alloy piping.

The GALL Report identifies the following criterion for the "scope of program" program element associated with the exception taken

> Loss of material in these components, which may be exposed to aggressive soil environment, is caused by general, pitting, and crevice corrosion, and microbiologically influenced corrosion (MIC). Periodic inspections are performed when the components are excavated for maintenance or for any other reason. The scope of the program covers buried components that are within the scope of license renewal for the plant.

The applicant states its program will include provisions for inspection of buried stainless steel and copper alloy piping. The project team 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, on the basis of its review of the operating experience, 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 project team finds this to be acceptable.

The GALL Report identifies the following criterion for the "parameters monitored/inspected" program element associated with the exception taken

> The program monitors parameters such as coating and wrapping integrity that are directly related to corrosion damage of the external surface of buried carbon steel piping and tanks. Coatings and wrappings are inspected by visual techniques. Any evidence of damaged wrapping or coating defects, such as coating perforation, holidays, or other damage, is an indicator of possible corrosion damage to the external surface of piping and tanks.

The applicant states 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. The project team reviewed the applicant's operating experience with excavations over the past few years and on the basis of its review, as well as the applicant's discussion of this exception in the FNP LRA, together with its April 7, 2004 letter, finds that the frequency of excavating buried components for maintenance activities will be sufficient for providing reasonable assurance 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 project team finds this exception to be acceptable.

The GALL Report identifies the following criterion for the "detection of aging effects" program element associated with the exception taken:

> Periodic inspection of susceptible locations to confirm that coating and wrapping are intact, is an effective method to ensure that corrosion of external surfaces has not occurred and the intended function is maintained. Buried piping and tanks are inspected when they are excavated during maintenance. The inspections are performed in areas with the highest likelihood of corrosion problems, and in areas with a history of corrosion problems. However, because the inspection frequency is plant specific and also depends on the plant operating experience, the applicant's proposed inspection frequency is to be further evaluated for the extended period of operation.

The applicant states that for uncoated/unwrapped piping, visual inspection will also be used to examine the external surfaces to confirm that no significant (detrimental) loss of material has occurred. The project team 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 found no instances of corrosion on the piping of these materials. On the basis of its review of operating experience and the materials' resistance to corrosion in a buried environment, the project team finds this exception to be acceptable.

The GALL Report identifies the following criterion for the "acceptance criteria" program element associated with the exception taken:

> Any coating and wrapping degradations are reported and evaluated according to site corrective actions procedures.

The applicant states that any significant loss of material in piping will be reported and evaluated according to site corrective action procedures. The project team reviewed the applicant's exception, which applies typically to uncoated and unwrapped buried stainless steel and copper alloy piping in the open-cycle closed cooling water and fire protection systems and the operating experience. On the basis of its review, the project team finds this exception to be acceptable.

7.1.13.4 Enhancements to the GALL Report

None

7.1.13.5 Operating Experience

The applicant states that FNP AMP B.5.4 is a new program. Therefore, no programmatic operating experience has been gained. The project team reviewed the FNP AMP master document SP-LR-AMP-19, where the applicant provides information concerning buried piping and tanks. Over the past four years, underground leaks due to external surface corrosion have been documented in primarily small-bore piping rather than large bore. Three underground leaks have been identified over the past four years (in-scope and out-of-scope systems). The

applicant was successful in detecting these leaks through monitoring ground conditions during normal site activities prior to any loss of system function.

The project team recognizes that the corrective action program, which captures internal and external plant operating experience issues, will provide reasonable assurance 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.

7.1.13.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the buried piping and tanks inspection program in FNP LRA, Appendix A, Section A.2.16. The applicant states that the buried piping and tank inspection program will be used to manage the loss of material from external surfaces of pressure-retaining buried carbon steel piping and tanks 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.

By letter dated July 27, 2004 (ML042180163), the applicant states that it will implement this program prior to entering the period of extended operation. The applicant added this commitment to its license renewal future action commitments list (Item No. 9).

The project team reviewed the UFSAR supplement and concurs that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.13.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the exception to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.14 ONE-TIME INSPECTION PROGRAM (FNP AMP B.5.5)

In FNP LRA Appendix B, Section B.5.5, the applicant describes FNP AMP B.5.5, "One-Time Inspection Program."

The applicant states that FNP AMP B.5.5 is a new and a plant-specific program. The program will be designed to provide objective evidence that an aging effect is not occurring, or that the aging effect is occurring slowly enough to not affect the component or structure intended function during the period of extended operation, and therefore will not require additional aging

management. Insofar as practical with respect to scheduled outages, the inspections will be performed within a window of five years immediately preceding the extended period of operation.

The applicant states, in the FNP LRA, that the its one-time inspection program will be used for cases where either (a) an aging effect is not expected to occur but there is insufficient data to completely disprove the effect, or (b) an aging effect is expected to progress very slowly and not require management during the period of extended operation. The program will also be used to verify the effectiveness of other AMPs to confirm the absence of an aging effect.

The applicant further states, in the FNP LRA, that the one-time inspection program will include in the sample set those components requiring aging management that are made of cast iron, bronze, brass, and other alloys that are exposed to environments that may lead to selective leaching of one of the metal constituents. In addition to one-time visual inspection, some components constructed from the aforementioned materials will be subjected to hardness testing.

Although it is credited as being a plant-specific AMP, the one-time inspection program will include elements to make it consistent with the programs described GALL AMPs XI.M32, "One-Time Inspection," and XI.M33, "Selective Leaching of Materials."

7.1.14.1 Review of the AMP Against the Program Elements

The project team reviewed FNP AMP B.5.5 against the AMP elements found in the SRP-LR, Appendix A, Section A.1.2.3 and SRP-LR Table A.1-1. In addition, the project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.5.5, including FNP AMP master document FNP SR-LR-AMP-20, "One-Time Inspection Program Master Document," which provides an assessment of the AMP's elements' of consistency with GALL AMPs XI.M32 and XI.M33. The guidance described in the FNP audit and review plan was followed.

7.1.14.1.1 Scope of Program

The applicant states in FNP AMP B.5.5, for the "scope of program" program element, that the one-time inspection program will be based upon (a) determination of the sample size based on an assessment of materials of fabrication, environment, aging effects, and operating experience; (b) identification of the inspection locations in the system or component based on the aging effect; (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined; and (d) evaluation of the need for follow-up examinations to monitor the progression of any aging degradation.

Specific components included in sample population: (1) pressurizer CASS spray heads and associated coupling/lock bar; (2) RCS small bore (less than 4-inch nominal pipe size (NPS 4)), butt-welded piping; (3) a RCP thermal barrier CCW nozzle; (4) cast iron, bronze, brass, and other alloy components in any systems requiring aging management that are exposed to environments that may lead to selective leaching; (5) a bounding chemical and volume control system letdown orifice or charging/safety injection pump mini-flow orifice (based on pressure drop); and (6) sample portion of the external surface of the service water piping in the diesel generator building which is obscured by guard piping. In addition, 26 in-scope systems are included in the scope of this program.

This program element criterion in Appendix A.1 of the SRP-LR states that the scope of the program should include the specific structures and components of which the program manages the aging.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1 of the SRP-LR. The project team finds that the proposed scope identifies the specific components for which the program manages aging. On this basis, the project team concludes that the applicant's proposed program scope is acceptable.

7.1.14.1.2 Preventive Actions

The applicant states in FNP AMP B.5.5, for the "preventive actions" program element, that the one-time inspection program is an inspection activity independent of methods to mitigate or prevent degradation.

The criterion for this program element in Appendix A.1 of the SRP-LR is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1 of the SRP-LR. The project team did not identify the need for preventive actions for AMP B.5.5 because it is a condition monitoring program.

7.1.14.1.3 Parameters Monitored/Inspected

The applicant states in FNP AMP B.5.5, for the "parameters monitored or inspected" program element, that it will use appropriate inspection and testing methods to monitor selected components for loss of material, cracking, fouling, change in material properties, and loss of fracture toughness, as applicable to the component selected. FNP LRA Tables 3.X.2.Y, in Sections 3.1 through 3.4, identify the systems, components, and the aging effects where the one-time inspection program is credited.

The criterion program element criterion in Appendix A.1 of the SRP-LR is

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s).

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team finds that the one-time inspection program identified SCs and linked the aging effects to the structures and components that are intended to detect the presence and extent of aging effects. On this basis, the project team concludes that the parameters monitored or inspected program element is acceptable.

7.1.14.1.4 Detection of Aging Effects

The applicant states in FNP AMP B.5.5, for this "detection of aging effects" program element, that it will perform one-time inspections on selected components using proven NDE methods including visual, volumetric, surface techniques, and hardness testing, as applicable to the selected components. Procedures will require that inspections or tests be conducted by qualified personnel.

The criteria for this program element criteria in Appendix A.1 of the SRP-LR are

> Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> This program element describes when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program).
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience.
>
> When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team finds that the applicant has identified, in general terms, the inspection methods as applicable to the components being inspected. These inspections will enhance the applicant's ability to detect aging effects before there is a loss of intended function. On this basis, the project team concludes that the monitoring and trending program element is acceptable.

7.1.14.1.5 Monitoring and Trending

The applicant states in FNP AMP B.5.5, for the "monitoring and trending" program element, that there is no monitoring or trending function associated with one-time inspections program.

The criterion for this program element in Appendix A.1 of the SRP-LR do not apply for one-time inspection program. However, the GALL AMP XI.M32, "One-Time Inspection Program" monitoring and trending program element criterion is

> One-time inspection does not provide specific guidance on monitoring and trending. However, evaluation of the appropriateness of the techniques and timing of the one-time inspection improve with the accumulation of plant-specific and industry-wide experience.

The applicant states, in the FNP LRA, that it plans to perform the examinations required by this program during the five-year window immediately prior to the period of extended operation. The applicant added a requirement to the scope of the one-time inspection program, beyond that contained in Appendix A.1, which would expand the sample size of items being examined when unacceptable examination findings are recorded. By letter dated December 5, 2003, (ML033430278), the applicant added this commitment to the one-time inspection program to the commitments list.

The project team reviewed and confirmed that this satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team also confirmed that this program satisfies the criterion defined in GALL AMP XI.M32. The project team finds that evaluation of the appropriateness of the techniques and timing of the one-time inspection will enhance the applicant's ability to detect

aging effects before there is a loss of intended function. On this basis, the project team concludes that the monitoring and trending program element is acceptable.

7.1.14.1.6 Acceptance Criteria

The applicant states in FNP AMP B.5.5, for the "acceptance criteria" program element, that any indication or relevant conditions of degradation detected are evaluated. The ultrasonic thickness measurements are to be compared to predetermined limits, such as design minimum wall thickness.

The criteria for this program element criteria in Appendix A.1 of the SRP-LR are

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation.
>
> The program should include a methodology for analyzing the results against applicable acceptance criteria.
>
> Qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site-specific programs.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR. The project team finds that any degradation that could lead to loss of function will be found unacceptable and corrective measures implemented. On this basis, the project team concludes that the acceptance criteria program element is acceptable.

7.1.14.1.7 Corrective Actions

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.14.1.8 Confirmation Process

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.14.1.9 Administrative Controls

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.14.1.10 Operating Experience

The applicant states in FNP LRA Appendix B.5.5.13, that there is no programmatic operating experience for this program. However, plant and industry operating experience will be considered in the selection of the component sample set.

The project team recognizes that the corrective action program, which captures internal and external plant operating experience issues, will provide reasonable assurance 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.

7.1.14.2 UFSAR Supplement

The applicant provides its UFSAR supplement for the one-time inspection program in FNP LRA, Appendix A, Section A.2.17. The applicant states that the one-time inspection 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.

The applicant states that the program will be administratively controlled by plant procedures. Administrative controls and procedures will be developed to identify the specific components which must be included, as well as the systems from which the remaining sample set will be collected.

By letter dated July 27, 2004 (ML042180163), the applicant states that it will implement this program prior to entering the period of extended operation. The applicant added this commitment to its license renewal future action commitments list (Item No. 10).

The project team reviewed the UFSAR supplement and finds that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.14.3 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the exception to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.15 NON-EQ ELECTRICAL CABLES USED IN INSTRUMENTATION CIRCUITS (ALTERNATE XI.E2) (FNP AMP B.5.6.1)

In FNP LRA, Appendix B, Section B.5.6.1, the applicant describes FNP AMP B.5.6.1, "Non-EQ Electrical Cables Used In Instrumentation Circuits," with exception.

The applicant states that AMP B.5.6.1 is a new inspection and testing program that will be implemented prior to the period of extended operation. It will be used to maintain the function of electrical cables which are not subject to the EQ requirements of 10 CFR 50.49, but are exposed to adverse localized environments caused by heat, radiation, or moisture. The applicant considered proposed ISG-05, (actually proposed ISG-15: Revision of Generic Aging Lessons Learned (GALL) Aging Management Program (AMP) XI.E2, "Electrical Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits") in preparation of the attributes for this new program.

The applicant states, in the FNP LRA, that the aspect of the Non-EQ cables program described in this section (Appendix B, Section B.5.6.1) is consistent with the program described in GALL AMP XI.E2 of NUREG-1801 with the exception that FNP will incorporate program details applicable to the specific types of cables within the scope of the program in accordance with the alternate E.2 program developed by the License Renewal Electrical Working Group.

7.1.15.1 Review of the AMP Against the Program Elements

The project team reviewed FNP AMP B.5.6.1 against the AMP elements found in the SRP-LR, Appendix A, Section A.1.2.3 and SRP-LR Table A.1-1. In addition, the project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 4 of this report for AMP B.5.6.1, including FNP AMP master document FNP SP-LR-AMP-21, "Non-EQ Cables Program Master Document." The guidance described in the FNP audit and review report was followed.

7.1.15.1.1 Scope of Program

The applicant states in FNP AMP B.5.6.1, the "scope of program" program element, that the scope of the non-EQ electrical cables used in instrumentation circuits will include electrical cables used in circuits with sensitive, high voltage, low-level signals such as radiation monitoring and nuclear instrumentation.

During the audit and review, the project team requested the applicant to clarify on how non-EQ containment electrical penetrations were considered. Table 4.4 of the FNP LRA "List of EQ Packages" describes specific EQ packages, but 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 (ML033430278), the applicant submitted its response. In its letter, 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 electrical portions of the penetrations that provide a connection function for non-safety related equipment are covered under the Non-EQ cables program.

This program element criterion in Appendix A.1 of the SRP-LR states that the scope of the program should include the specific structures and components of which the program manages the aging. Furthermore, the "scope of program" program element criterion in GALL AMP XI.E2 states that this program applies to electrical cables used in circuits with sensitive, low-level

signals such as radiation monitoring and nuclear instrumentation that are within the scope of license renewal.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1 of the SRP-LR. The project team finds that the proposed scope identifies the specific components for which the program manages aging. On this basis, the project team concludes that the applicant's proposed program scope is acceptable.

7.1.15.1.2 Preventive Actions

The applicant states in FNP AMP B.5.6.1, for the "preventive actions" program element, that this testing program includes no actions to prevent or mitigate aging degradation.

The criterion for this program element in Appendix A.1 of the SRP-LR is that condition monitoring or testing programs do not rely on preventive actions, and thus, preventive actions need not be provided.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1 of the SRP-LR. The project team did not identify the need for preventive actions for AMP B.5.6.1 because it is a condition monitoring and testing program.

7.1.15.1.3 Parameters Monitored/Inspected

The applicant states in FNP AMP B.5.6.1, for the "parameters monitored or inspected" program element, 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. The parameters monitored will be determined from the type of test performed and will be specific to radiation monitoring and nuclear instrumentation circuits. The technical basis for the sample will be documented.

The criterion for this program element in Appendix A.1 of the SRP-LR is

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s).

The project team observed that there is a typographic error in the FNP LRA Section 5.6.1. Specifically, the applicant reference ISG-5 instead of ISG-15. In its letter dated December 5, 2003 (ML033430278), the applicant states that the correct reference is ISG-15.

The applicant states, in the FNP LRA, that it considered ISG-15 in preparation of the attributes for this new program, so a comparison to ISG-15 was included in this audit. The proposed ISG-15 is a revision of GALL AMP XI.E2, "Electrical Cables Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits."

During its audit, the project team identified one difference between the GALL AMP and the FNP AMP. The applicant states, in the FNP LRA, that a representative sample of instrumentation circuits will be tested. GALL AMP XI.E2 and ISG-15 do not stipulate the use of sampling. The project team 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 FNP AMP B.5.6.1 element as it exists in the FNP LRA for parameters monitored or inspected, to test all cables in the alternate XI.E2 program, rather than a sample. In its letter dated December 5, 2003 (ML033430278), the applicant states that sampling will be removed from the alternate XI.E2 program and that all cables will be tested. Based on its review of the revision to make the FNP AMP B.5.6.1 consistent with alternate XI.E2 and ISG-15 program element, the project team finds this acceptable.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR and ISG-15. The project team finds that the non-EQ electrical cables used in instrumentation circuits program activities detect the conditions that potentiate degradation and also detect the presence and extent of aging effects. On this basis, the project team concludes that the parameters monitored or inspected program element is acceptable.

7.1.15.1.4 Detection of Aging Effects

The applicant states in FNP AMP B.5.6.1, for the "detection of aging effects" program element, that a representative sample of instrumentation circuit cables with sensitive, high voltage, low-level signals that are installed in adverse localized environments will be tested at least once every ten years. The type of test performed will be applicable to radiation monitoring and nuclear instrumentation circuits. The first test will be completed before the beginning of the period of extended operation.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> This program element describes when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program).
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience.
>
> When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

During its audit, the project team observed that there is a typographic error in the FNP LRA Section 5.6.1. Specifically, the applicant reference ISG-5 instead of ISG-15. In its letter dated December 5, 2003 (ML033430278), the applicant states that the correct reference is ISG-15.

The applicant states, in the FNP LRA, that it considered ISG-15 in preparation of the attributes for this new program, so a comparison to ISG-15 was included in this audit. The proposed ISG-15 is a revision of GALL AMP XI.E2, "Electrical Cables Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits."

The project team identified one difference between the GALL AMP and the FNP AMP. The applicant states, in the FNP LRA, that a representative sample of instrumentation circuits will be tested. GALL AMP XI.E2 and ISG-15 do not stipulate the use of sampling. The project team 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 FNP LRA AMP B.5.6.1 element as it exists in the FNP LRA for the detection of aging effects, to test all cables in the alternate XI.E2 program, rather than a sample. In its letter dated December 5, 2003 (ML033430278), the applicant states that sampling will be removed from the alternate XI.E2 program and that all cables will be tested. The project team reviewed the applicant's response, and based on the revision to make the FNP AMP B.5.6.1 consistent with alternate XI.E2 and program element, the project team finds this acceptable.

The project team reviewed and confirmed that this program element satisfies the criteria defined in Appendix A.1 of the SRP-LR and ISG-15. The project team finds that the inspections use a frequency and sample of instrumentation circuit cables based on existing codes and operating experience to detect the presence and extent of aging effects. On that basis, the project team finds that the detection of aging effects program element is acceptable.

7.1.15.1.5 Monitoring and Trending

The applicant states in FNP AMP B.5.6.1, for the "monitoring and trending" program element, that monitoring and trending are not included in this program. Industry data indicates that the ability to trend results is limited.

The criteria program element in Appendix A.1 of the SRP-LR are

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.
>
> This program element describes how the data collected are evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

However, GALL AMP XI.E2 states that trending actions are not included as part of this program because the ability to trend test results is dependent on the specific type of test chosen.

The project team reviewed and confirmed that this program element is consistent with GALL AMP XI.E2 such that monitoring and trending are not included in this program. On this basis, the project team finds that the monitoring and trending program element is acceptable.

7.1.15.1.6 Acceptance Criteria

The applicant states in FNP AMP B.5.6.1, for "acceptance criteria" program element, that each test performed on radiation monitoring and nuclear instrumentation circuits will be defined by the specific type of test performed and the specific cable tested.

The criteria for this program element in Appendix A.1 of the SRP-LR are

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation.
>
> The program should include a methodology for analyzing the results against applicable acceptance criteria.
>
> Qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site-specific programs.

The criteria for this program element in GALL AMP XI.E2 and ISG-15 is that calibration results or findings of surveillances are to be within the acceptance criteria, as set out in the surveillance procedures.

During the audit, the project team identified one difference between the GALL AMP and the FNP AMP. In FNP AMP 5.6.1, the applicant states that acceptance criteria program element did not specify the use of calibration and surveillance testing, and excluded it in the AMP operating experience section, which states, 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 GALL AMP XI.E2 use of operating experience in that changes in instrument calibration are not used." In discussions with the project team, the applicant stated that nuclear instrumentation circuits would be tested because the instruments are calibrated with the cables disconnected, and that cable testing is a more desirable approach for this application because the calibration results would provide minimal information about the cables. By letter dated December 5, 2003 (ML033430278), the applicant submitted a supplement to its FNP LRA. In its response, the applicant reiterates why the alternate XI.E2 program was used. The project team reviewed the applicant's response and based on its review and on the discussion above, the project team concludes that because the cables are disconnected during the calibration test, and because the applicant agreed to test all cables, this exception to use the alternate XI.E2 program as identified in ISG-15 is acceptable.

The project team reviewed and confirmed that this program element is consistent with GALL AMP XI.E2. On this basis, the project team finds that the monitoring and trending program element is acceptable.

7.1.15.1.7 Corrective Actions

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.15.1.8 Confirmation Process

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.15.1.9 Administrative Controls

This program element is reviewed by the NRR DIPM staff and addressed in Section 3 of the SER related to the FNP LRA.

7.1.15.1.10 Operating Experience

The applicant states in FNP AMP B.5.6.1, for the operating experience program element that this AMP is a new program with no operating experience history. However, effective and proven testing techniques will be used for this new program. Lessons learned during the performance of this program, additional industry experience, and other testing techniques developed in the industry will be considered.

The applicant states, 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 states in GALL AMP XI.E2 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 industry-wide 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 project team noted that connectors were included in the operating experience attribute of ISG-15, but not in FNP AMP 5.6.1. To clarify this, the applicant stated that connectors were included in GALL AMP XI.E2, and that FNP AMP 5.6.1 will be revised to include the draft ISG-15 wording for this attribute. By the dated December 5, 2003 (ML033430278), the applicant submitted a supplement to the FNP LRA. In its response, the

applicant agreed to revise the AMP master document to incorporate this wording. The project team reviewed and confirmed that FNP AMP master document has been revised and finds it to be acceptable.

On the basis of its review and on discussions with the applicant's technical staff, the project team concludes that FNP AMP 5.6.1 adequately manages the aging effects that have been observed at the applicant's plant.

7.1.15.2 UFSAR Supplement

The applicant provided its UFSAR supplement for the non-EQ electrical cables used in instrumentation circuits in FNP LRA, Appendix A, Section A.2.19 which states that this is a new monitoring program that will be implemented prior to the period of extended operation. It will be used to maintain the function of electrical cables that are not subject to the EQ requirements of 10 CFR 50.49, but are exposed to adverse localized environments caused by heat, radiation, or moisture.

The applicant states that the program will be administratively controlled by procedures. The scope will include (1) accessible electrical cables installed in adverse localized environments caused by heat or radiation, coupled with the presence of oxygen, (2) electrical cables used in circuits with sensitive, high voltage, low-level signals such as radiation monitoring and nuclear instrumentation, and (3) inaccessible medium voltage cables that are exposed to significant moisture and voltage at the same time.

By letter dated July 27, 2004 (ML042180163), the applicant states that it will implement this program prior to entering the period of extended operation. The applicant added this commitment to its license renewal future action commitments list (Item No. 12).

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.15.3 Conclusion

On the basis of its audit and review of the applicant's program, the project team finds that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, on the basis of its review of the exception to the GALL program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.16 NON-EQ ELECTRICAL CABLES EXPOSED TO ADVERSE LOCALIZED ENVIRONMENTS AND INACCESSIBLE MEDIUM VOLTAGE CABLES (FNP AMP B.5.6.2)

In the FNP LRA, Appendix B, Section 5.6.2, the applicant states that FNP AMP B.5.6.2, "Non-EQ Electrical Cables Exposed To Adverse Localized Environments and Inaccessible Medium Voltage Cable" is consistent with the programs described in GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," and GALL AMP XI.E3, "Inaccessible Medium-voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

7.1.16.1 Program Description

In the FNP LRA, the applicant states the FNP AMP B.5.6.2 is a new inspection and testing program that will be implemented prior to the period of extended operation. It will be used to maintain the function of electrical cables that are not subject to the EQ requirements of 10 CFR 50.49, but are exposed to adverse localized environments caused by heat, radiation, or moisture.

The applicant also states, in the FNP LRA, that except for inaccessible medium voltage cables, this inspection and testing program includes no actions to prevent or mitigate aging degradation. For medium voltage cables, periodic inspections for water accumulation in cable pull boxes will be conducted and water will be drained as necessary.

The applicant further states, in the FNP LRA, that the aging effect of reduced insulation resistance resulting from water treeing requires evaluation for non-EQ inaccessible medium-voltage cables exposed to moisture and voltage stress. The cables to be included in the program are the B Train 4 Kilovolt (kV) power cables for the service water intake structure and the 4kV power cables to the high voltage switchyard. The applicant's non-EQ cables and connections program, SP-LR-AMP-21, includes two activities to manage the aging effects of medium voltage cables exposed to significant moisture and voltage stress: (1) removal of water with periodic inspections to ensure the cables are not wet, and (2) testing of cables that become wet during the renewal term.

7.1.16.2 Consistency with the GALL Report

The project team reviewed the applicant's master document SP-LR-AMP-21, "Non-EQ Cables Program," Revision 0 and 1, and the available implementing procedure FNP-0-GMP-60.1, "Farley Nuclear Plant General Maintenance Procedure - General Inspection Outdoor Electrical Duct Run Pull Boxes."

During the audit, the project team identified difference between GALL AMP XI.E1 and the FNP AMP regarding the attributes for the scope. The applicant's program scope description included cables, but not connections (i.e., terminal blocks, splices, connectors, fuse holders), as specified in GALL AMP XI.E1. To address this difference, the applicant revised the AMP scope, in

Revision 1 of the master document SP-LR-AMP-21, to include “connections”, as described above. The project team reviewed the revised FNP AMP scope and finds it acceptable.

During the audit, the project team also identified differences between GALL AMP XI.E3 and the FNP AMP regarding the attributes for the scope, preventive actions, and detection of aging effects. The FNP AMP 6.5.3 scope did not reiterate the GALL AMP XI.E3 definition of “significant moisture” and “significant voltage” exposure. The definition of significant moisture is pertinent to aging management of cables that could be temporarily flooded. To clarify the FNP AMP B.5.6.3 scope, the applicant revised this AMP to reiterate these two GALL AMPs definitions. The project team reviewed Revision 1 of the master document SP-LR-AMP-21 and finds it acceptable.

In addition, the project team noted that the program scope description in the FNP LRA and the AMP program documentation did not present or reference a discussion of which cables, if any, were considered to be designed for submergence. To be consistent with the FNP AMP master document, the applicant revised FNP AMP B.5.6.3 program scope to state that no credit is taken for submerged cables. The project team reviewed the revised FNP AMP B.5.6.3 and finds it acceptable.

The project team determined that the use of a “representative sample” for detection of aging effects is not consistent with GALL program XI.E3, which does not stipulate sampling for inaccessible medium voltage cables. The project team noted that the number of such inaccessible cables should be comparatively small (for example, service water pump motor feeder cables). To address this difference, the applicant revised FNP AMP master document SP-LR-AMP-21 such that all GALL AMP XI.E3 cables are included, rather than a sample. The team reviewed Revision 1 of the master document SP-LR-AMP-21 and finds it acceptable.

GALL AMP XI.E3, Evaluation and Technical Basis, Item 2, Preventive Actions, states: *“Periodic actions are taken to prevent cables from being exposed to significant moisture, such as inspecting for water collection in cable manholes and conduit, and draining water as needed...*” The FNP AMP master document SP-LR-AMP-21 stipulated periodic actions. However, in reviewing AMP implementing procedure FNP-0-GMP-60.1, “Farley Nuclear Plant General Maintenance Procedure - General Inspection Outdoor Electrical Duct Run Pull Boxes,” the project team determined that the procedure does not specify periodicity. In response to the team’s questions, the applicant stated that the FNP Repetitive Task Program generates a work order to invoke this procedure. The applicant stated that the repetitive task is normally once per five years for each pull box, but once per year for those prone to water, and there is no requirement to check the pull boxes via this procedure after a heavy rain or flooding. Therefore, with the current implementing procedures, the applicant states that it would need to treat all GALL AMP XI.E3 inaccessible medium voltage cables as being exposed to “significant moisture,” thus requiring a proven cable testing program. On that basis, the project team concludes that the current version and usage of this implementing procedure are not consistent with GALL AMP XI.E3. The applicant noted that FNP-0-GMP-60.1 and the Repetitive Task Program have not been revised to meet any requirements for an extended period of operation

associated with license renewal, and the applicant has not yet developed cable test procedures or other implementing procedures.

In response to questions from the project team, the applicant stated that it has reviewed and confirmed that all manholes/pull boxes are at low points on the associated conduit/raceway routes, so that inspection for water in the pull box would be representative, because inaccessible points would be at higher elevations than the pull box being inspected. The applicant revised the FNP AMP B.5.6.3 program documentation associated with GALL AMP XI.E3 to document this basis. The project team reviewed Revision 1 of the master document SP-LR-AMP-21 and finds it acceptable.

The project team performed a review of the applicable criteria in GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," and GALL AMP XI.E3, "Inaccessible Medium-voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," and the program description and elements for FNP AMP B.5.6.2, "Non-EQ Electrical Cables Exposed To Adverse Localized Environments and Inaccessible Medium Voltage Cable." Based on its review, the project team concludes that the applicant's non-EQ electrical cables exposed to adverse localized environments and inaccessible medium voltage cables provides reasonable assurance of aging management to be used to maintain the function of electrical cables that are not subject to the EQ requirements of 10 CFR 50.49, but are exposed to adverse localized environments caused by heat, radiation, or moisture and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for Non-EQ cables program, as discussed in GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," and GALL AMP XI.E3, "Inaccessible Medium-voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

7.1.16.3 Exceptions to the GALL Report

None

7.1.16.4 Enhancements to the GALL Report

None

7.1.16.5 Operating Experience

The applicant states, in the FNP LRA, that FNP AMP B.5.6.3 is a new inspection and testing program that will be implemented prior to the period of extended operation. The applicant states that it considered and documented operating experience in its commodity group review (CGR) master documents, which the project team reviewed. The applicant inspected pull boxes located in duct runs between in-scope structures to determine whether any conduits containing in-scope circuits were submerged. The inspections revealed that four safety-related and two non-safety-related pull boxes contained significant standing water. The CGR stipulated that, in the current

term, the drainage system for the in-scope pull boxes will be modified to allow the water in the boxes to drain. Any in-scope cables that have been submerged will be tested to ensure that they are capable of performing their intended function. The pull boxes will be inspected during the current term to ensure that the drainage system is working properly and submergence has not occurred.

On the basis of its review of the above operating experience and on discussions with the applicant's technical staff, the project team concludes that FNP AMP B.5.6.3 adequately manages the aging effects that have been observed at the applicant's plan.

7.1.16.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the non-EQ electrical cables exposed to adverse localized environments and inaccessible medium voltage cable in FNP LRA, Appendix A, Section A.2.19 which states that this is a new inspection and testing program that will be implemented prior to the period of extended operation. It will be used to maintain the function of electrical cables that are not subject to the EQ requirements of 10 CFR 50.49, but are exposed to adverse localized environments caused by heat, radiation, or moisture.

The program will be administratively controlled by procedures. The scope will include (1) accessible electrical cables installed in adverse localized environments caused by heat or radiation, coupled with the presence of oxygen, (2) electrical cables used in circuits with sensitive, high voltage, low-level signals such as radiation monitoring and nuclear instrumentation, and (3) inaccessible medium voltage cables that are exposed to significant moisture and voltage at the same time.

By letter dated July 27, 2004 (ML042180163), the applicant states that it will implement this program prior to entering the period of extended operation. The applicant added this commitment to its license renewal future action commitments list (Item No. 12).

The project team reviewed the UFSAR supplement and confirms that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.16.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.17 FATIGUE MONITORING PROGRAM (FNP AMP B.5.7)

In the FNP LRA Appendix B, Section B.5.7, the applicant states that FNP AMP B.5.7, "Fatigue Monitoring Program," is consistent with GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

7.1.17.1 Program Description

In the FNP LRA, the applicant states that the fatigue monitoring program is a new program and it will be used to monitor fatigue conditions of the metal piping and components that form the reactor coolant pressure boundary. Specifically included will be the pressurizer subcomponents, the reactor pressure vessel (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.

The applicant also states, in the FNP LRA, that it currently conducts cycle counting using the component cyclic transient limit program as required by the FNP technical specifications. The applicant will modify the current manual counting method to use fatigue monitoring software to automatically count monitored cycles using installed plant equipment. The software has the capability to manually enter those cycles that cannot be automatically counted. By counting these cycles and demonstrating that current and projected cycles are less than were assumed in design fatigue calculations, the applicant will demonstrate that those calculations remain valid and therefore the fatigue cumulative usage factor will remain below the ASME Section III design limit. The cycle counting portion of the program will count plant transients that are significant contributions to the fatigue cumulative usage factor. Top and bottom mounted resistance temperature detectors will be used to monitor locations susceptible to thermal stratification (NRC Bulletin 88-08, Thermal Stresses in Piping Connected to Reactor Cooling Systems) to verify that stratification is not occurring at those locations. In addition to cycle counting, the fatigue monitoring software will be used to conduct stress based fatigue monitoring of the surge line and lower region of the pressurizer. This portion of the software calculates an estimate of the fatigue cumulative usage factor due to changes in temperature, pressure, or other parameters that affect the fatigue of those components. This portion of the software also accounts for insurge/outsurge and thermal stratification effects.

7.1.17.2 Consistency with the GALL Report

In the FNP LRA, the applicant states that FNP AMP B.5.7 will be consistent with GALL AMP X.M1.

The applicant states, in the FNP LRA, that the design basis metal fatigue analyses for the FNP reactor coolant pressure boundary are TLAAs. Consistent with GALL AMP X.M1, the applicant has selected fatigue monitoring as an acceptable option for managing cracking due to metal fatigue for components in the reactor coolant pressure boundary (demonstration per

10 CFR 54.21(c)(1)(iii)). The applicant states that it will rely on the fatigue monitoring program to manage fatigue cracking in conjunction with a demonstration that the number of cycles assumed in the design basis transients remains bounding for the extended period of operation.

As described in Section 4.3.1 of the FNP LRA, the applicant has evaluated the effects of environmentally assisted fatigue on piping and components comparable to the locations evaluated in Section 5.4 of NUREG/CR-6260. The program will include monitoring for thermal stratification at susceptible locations in addition to the current transient counting required by technical specifications.

The project team reviewed FNP SP-LR-AMP-22, “Fatigue Monitoring Program” and FNP “Cycle Counting Logic for the Automated Cycle Counting System at Farley 1 and 2.” Based on its review, the project team finds that FNP AMP B.5.7 is consistent with GALL AMP X.M1.

The project team performed a review of the applicable criteria in GALL AMP X.M1, “Metal Fatigue of Reactor Coolant Pressure Boundary,” and the program description and elements for the applicant's FNP AMP B.5.7, “Fatigue Monitoring Program.” Based on its review, the project team concludes that the fatigue monitoring program provides reasonable assurance of aging management of fatigue conditions of the metal piping and components that form the reactor coolant pressure boundary and is acceptable because the AMP conforms to the recommended program description, program elements, and acceptance criteria for fatigue monitoring program, as discussed in GALL AMP X.M1, “Metal Fatigue of Reactor Coolant Pressure Boundary.”

7.1.17.3 Exceptions to the GALL Report

None

7.1.17.4 Enhancements to the GALL Report

None

7.1.17.5 Operating Experience

The applicant states in FNP AMP B.5.7, that in 1987, FNP Unit 2 experienced a through wall leak on a short, unisolable section of the emergency core cooling system (ECCS) piping that is connected to the cold leg of loop B of the RCS. This event led to the issuance of NRC Bulletin 88-08, “Thermal Stresses in Piping Connected to Reactor Coolant System.” Since then, the cycle counting and monitoring methods that preceded the FNP fatigue monitoring program have steadily improved. Significant effort has been put into establishing accurate baseline cycle counts. In addition, the applicant has recently purchased and installed an industry-recognized computer program to improve fatigue monitoring capabilities.

The applicant states, in the FNP LRA, that the operating experience program is used to review industry experience, and to disseminate information to the rest of the industry. For example, the

information contained in NRC Bulletins 88-08 and 88-11, “Pressurizer Surge Line Thermal Stratification,” has been incorporated into its fatigue monitoring plan.

On the basis of its review of the above discussion and discussions with the applicant’s technical staff, the project team concludes that FNP AMP B.5.7 will adequately manage the aging effects that have been observed at the applicant’s plant.

7.1.17.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the fatigue monitoring program in FNP LRA, Appendix A, Section A.3.2. The applicant states that the design basis metal fatigue analyses for the FNP reactor coolant pressure boundary are TLAAs. The fatigue monitoring program will be used to monitor plant transients that are significant contributions to the fatigue cumulative usage factor. Demonstration that plant cycles have not exceeded design assumptions during the period of extended operation will ensure that the design limit on fatigue usage will not be exceeded.

The applicant states that it will fully implement the program prior to entering the period of extended operation. When fully implemented, the program will include monitoring for thermal stratification at susceptible locations in addition to the current transient counting required by technical specifications. The applicant has evaluated the effects of environmentally assisted fatigue on piping and components comparable to the locations evaluated in Section 5.4 of NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components.” The results of that evaluation are given in the FNP LRA, Section A.4.2.1.

By letter dated July 27, 2004 (ML042180163), the applicant states that it will implement this program prior to entering the period of extended operation. The applicant added this commitment to its license renewal future action commitments list (Item No. 13).

The project team reviewed the UFSAR supplement and finds that it provides an adequate summary description of the program, as identified in the SRP-LR UFSAR supplement table and as required by 10 CFR 54.21(d).

7.1.17.7 Conclusion

On the basis of its audit and review of the applicant's program, the project team 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

On the basis of its review of the UFSAR supplement for this AMP, the project team also finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.2 Aging Management Reviews

The project team's audit and review activities for the FNP aging management reviews and its conclusions regarding these reviews are documented below.

For its AMR reviews, the project team determined that the AMRs reported by the applicant to be consistent with the GALL Report are consistent with the GALL Report and determine that the plant-specific AMRs reported are technically acceptable. For component groups evaluated in the GALL Report for which the applicant claimed consistency with the GALL Report, and for which the GALL Report recommended further evaluation, the project team reviewed the applicant's evaluation to determine whether or not it adequately addressed the issues for which the GALL Report recommended further evaluation.

The AMRs reviewed by the project team in LRA Tables 3.X.2-Y (Table 2s) in Chapter 3 of the LRA were those consistent with the GALL Report, as identified by LRA table Notes A through E. In LRA Tables 3.X.2-Y, in addition to the notes, the applicant provided a summary of AMRs for the applicable systems which included SCs, associated materials, environment, aging effect requiring management, and an AMP for each line item. The notes describe how the information in the tables aligns with the information in the GALL Report, and are defined below.

> Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified in the GALL Report.
>
> Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the AMP identified in the GALL Report. The project team verified that the identified exceptions to the GALL AMPs are acceptable.
>
> Note C indicates that the component for the AMR line item is different, but consistent with the GALL Report for material, environment, and aging effect. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report. However, the applicant identified a different component in the GALL Report that had the same material, environment, aging effect, and AMP as the component that was under review. The project team verified that the AMR line item of the different component was applicable to the component under review.
>
> Note D indicates that the component for the AMR line item is different, but consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the AMP identified in the GALL Report. The project team reviewed these line items to determine consistency with the GALL Report. The project team verified that the AMR line item of the different component was applicable to the component under review. The project team verified that the identified exceptions to the GALL AMPs are acceptable.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different AMP is credited. The project team reviewed these line items to determine consistency with the GALL Report.

The project team conducted an audit and review of the information provided in the FNP LRA and program bases documents, which are available at the applicant's engineering office. On the basis of its audit and review, the project team found that the applicable aging effects were identified, the appropriate combination of materials and environments were listed, and acceptable AMPs were specified.

On the basis of its review, the project team concluded that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The reviews of FNP LRA Sections 3.1 through 3.6 that were performed by the project team are documented below.

7.2.1 FNP LRA Section 3.1 - Aging Management of Reactor Vessel, Internals, and Reactor Coolant System

In the FNP LRA, Section 3.1, the applicant provides the results of its aging management reviews for in-scope components for the reactor vessel, internals, and RCS.

In the FNP LRA Tables 3.1.2-1 through 3.1.2-4, the applicant provides a summary of the AMRs for component types associated with the (1) reactor vessel, (2) RVI, (3) RCS and connected lines (including the reactor coolant pumps and pressurizer), and (4) SGs. The summary information for each component type included intended function; material; environment; aging effect requiring management; AMPs; the GALL Report, Volume 2 item, cross referenced to FNP LRA Table 3.1.1; and, generic and plant-specific notes related to consistency with the GALL Report.

The applicant also identifies for each component type in FNP LRA Table 3.1.1 those components where further evaluation is recommended, those for which no further evaluation is required, and those that are not applicable to FNP together with the basis for their exclusion.

The applicant also identifies, in FNP LRA Tables 3.1.2-1 through 3.1.2-4, which AMR results it considers to be consistent with the GALL Report (table column Notes A through E) and which it justifies on a different basis.

The AMRs that are within the scope of the project team audit and review are those AMR results it considers to be consistent with the GALL Report (table column Notes A through E).

The project team conducted its audit and review in accordance with SRP-LR Section 3.1.3 and the FNP audit and review plan.

7.2.1.1 Aging Management Evaluations That Are Consistent With the GALL Report, for Which No Further Evaluation Is Required

For aging management evaluations that the applicant states are consistent with the GALL Report and for which further evaluation is not recommended, the project team conducted its audit and review to determine if the applicant's reference to the GALL Report in the FNP LRA is acceptable.

The project team reviewed the FNP LRA to confirm that the applicant (1) provides a brief description of the system, components, materials, and environment; (2) states that the applicable aging effects have been reviewed and are evaluated in the GALL Report; and (3) identifies those aging effects for the reactor vessel, internals, and RCS components that are subject to an AMR.

7.2.1.1.1 Loss of Fracture Toughness Due to Thermal Aging, Irradiation Embrittlement, and Void Swelling (Table 3.1.1, Item 3.1.1-37)

The applicant states in FNP LRA, Table 3.1.1, Item 3.1.1-37 that it takes an exception to a higher threshold value for neutron fluence effects on stainless steel than does the GALL Report. However, this exception is not identified in FNP LRA AMP B.5.1, "Reactor Vessel Internals Program."

The staff forwarded RAI 3.1-1, requesting the applicant to submit the higher neutron threshold value and the justification for its use. By letter dated March 5, 2005 (ML040710873), the applicant submitted its response. In its letter, the applicant states that it 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," which has been accepted by the staff. The applicant further states that the RVI 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 FNP RVI program provides for inspection and monitoring of these leading locations.

Based on its review of the applicant's response, the project team finds the applicant's response acceptable because the staff has accepted the higher neutron fluence value for stainless steel as identified in WCAP-14577-A, Revision 1, and the applicant is including components with the highest fluence value in the RVI program for inspection and monitoring.

7.2.1.1.2 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 FNP LRA Table 3.1.2-3, the applicant did not credit the ISI program is to manage cracking of non-Class 1 piping and valve components. However, in FNP LRA, Table 3.1.1, Item 3.1.1-36 (linked to the non-Class 1 piping and valve bodies) states, "The FNP AMR results are consistent

with this summary item. Consistent with NUREG-1801, the water chemistry program and the ISI program will manage cracking of these components."

The project team noted, during the audit, that there is an apparent inconsistency between the two tables of the FNP LRA. The project team requested that the applicant explain whether the ISI program is credited for the non-Class 1 piping and valve bodies and, if necessary, correct the apparent inconsistency.

By letter dated April 16, 2004 (ML041180569), the applicant provides its supplement to the LRA. In its response, the applicant states that the ISI program is not credited for managing cracking of non-Class 1 piping and valve components. For clarity, the applicant states that the second paragraph of the discussion text contained in Table 3.1.1, Item 3.1.1-36 of the FNP 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 on review of the applicant's response, the project team finds that this line item is acceptable.

7.2.1.1.3 Loss of Fracture Toughness Due to Thermal Aging Embrittlement (Table 3.1.1, Item 3.1.1-24)

In Table 3.1.1, Item 3.1.1-24 of the FNP 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 FNP 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 project team 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 project team 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 (ML042390474), the applicant provided its supplemental information to FNP LRA. In its response, the applicant states that, consistent with GALL Report, it will use enhanced volumetric examination or a flaw tolerance evaluation to demonstrate that CASS piping components that are potentially susceptible to thermal embrittlement have adequate fracture toughness.

The applicant further states that in FNP 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 project team reviewed the applicant's response, finds the response consistent with the GALL Report recommendation and, therefore, is acceptable.

On the basis of its audit and review, the project team determined that for AMRs not requiring further evaluation, as identified in FNP LRA Table 3.1.1, are consistent with the GALL Report and are, therefore, acceptable.

7.2.1.2 Aging Management Evaluations That Are Consistent With the GALL Report, for Which Further Evaluation Is Recommended

For some line items consistent with the GALL Report in FNP LRA Tables 3.1.2-1 through 3.1.2-4, the GALL Report recommends further evaluation. When further evaluation is recommended, the project team reviewed these further evaluations provided in FNP LRA Section 3.1.2.2 against the criteria provided in SRP-LR Section 3.1.2.2. The following provides the project team’s assessments of these further evaluations. These project team assessments are applicable to each Table 2 line item in Section 3.1 citing the item in Table 1.

The FNP LRA sections, identified in FNP LRA Table 3.1.1, where further evaluation is recommended are discussed below.

7.2.1.2.1 Cumulative Fatigue Damage (FNP LRA 3.1.2.2.1)

FNP LRA Section 3.1.2.2.1 is reviewed by the NRR Division of Engineering (DE) staff and addressed in Section 4 of SER related to the FNP LRA.

7.2.1.2.2 Loss of Material due to Pitting and Crevice Corrosion (FNP LRA 3.1.2.2.2)

The project team reviewed FNP LRA Section 3.1.2.2.2 against the criteria in SRP-LR Section 3.1.2.2.2, which addresses loss of material in PWR SG assemblies.

In the FNP LRA Section 3.1.2.2.2, the applicant states that FNP will manage loss of material in the SG shells and transition cone due to pitting and crevice corrosion with the water chemistry control program (FNP AMP B.3.2). The ISI program (FNP AMP B.3.1) will detect crack growth due to cyclic loading.

SRP-LR Section 3.1.2.2.2 states that loss of material due to pitting and crevice corrosion could occur in the PWR SG shell assembly. The existing program relies on control of water chemistry to mitigate corrosion and inservice inspection to detect loss of material. NRC IN 90-04, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators," states that if general corrosion pitting of the shell exists, the existing program may not be sufficient to detect pitting and crevice corrosion of the shell. In that case, the GALL Report recommends augmented inspections to manage the aging effect. NRC IN 90-04 also identifies operating experience with pitting of Westinghouse SGs Models 44 and 51.

The AMPs recommended by the GALL Report for managing the aging of steam generator assemblies due to pitting and crevice corrosion are GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" program to detect loss of material and GALL AMP XI.M2, "Water Chemistry" program to mitigate corrosion. The GALL Report recommends a plant-specific program to conduct augmented inspections.

The project team notes that in FNP LRA, Table 3.1.2-4, page 3.1-79, for upper shells, lower shells, and transition cone component type, the applicant credits water chemistry control program alone for loss of material aging effect. FNP 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."

GALL Report Item IV.D1.1-c recommends water chemistry control program and ISI program to manage the loss of material. Thus, Note "A" is not applicable. Also, 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 the water chemistry control program is used for loss of material, but ISI program is used for cracking. This section only addresses loss of material due to pitting and crevice corrosion. Also, the applicant states that no augmented inspections are required, since the steam generators were replaced, and, since then, water chemistry has been maintained per EPRI standards. However, the LRA Section 3.1.2.2.2 did not state that ISI will be performed for loss of material or that the ISI that is performed for managing cracking would also be used for loss of material. The project team requested the applicant to provide clarification.

By letter dated July 16, 2004 (ML042100057), the applicant provides its supplemental information to the LRA. In its response, the applicant states that for the upper shells, lower shells, and transition cones component type, GALL Report Item IV.D1.1-c should not have been applied to cracking, only to loss of material. LRA Note "H" should have been applied to the cracking line item instead of Notes "A" and "9". The applicant also states that for the upper shells, lower shells, and transition cones component type, it considered crack growth due to

cyclic loading as an aging effect requiring management, with existing ASME Section XI inspection requirements performed by the ISI program credited to manage cracking. For loss of material associated with the upper shells, lower shells, and transition cones, the aging management programs listed should have included both the water chemistry control program and the ISI program. Water chemistry controls directly mitigate the loss of material within the steam generator shell assemblies. The ISI program inspections are not specifically designed to detect loss of material due to corrosion. However, ASME Section XI requirements implemented by the ISI 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 loss of material associated with these components are managed by water chemistry program alone. 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 project team finds that this line item is acceptable.

NRC IN 90-04 identifies the need to augment inspections beyond the requirements of ASME Section XI if general corrosion pitting of the steam generator 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 project team 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 steam generators have just been replaced and water chemistry has been strictly maintained per EPRI guidelines, the project team concludes that the applicant has adequately addressed the management of this aging effect and that augmented inspections are not required. The project team's review of the water chemistry control program and the ISI program are discussed in Section 7.1.2 and 7.1.1 of this report, respectively.

On the basis of its review, the project team 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 project team 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).

7.2.1.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement (FNP LRA 3.1.2.2.3)

The project team reviewed FNP LRA Section 3.1.2.2.3 against the criteria in the SRP-LR Section 3.1.2.2.3.

In the FNP LRA Section 3.1.2.2.3, the applicant addresses (1) 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, (2) loss of fracture toughness due to irradiation embrittlement of the reactor vessel beltline material, and (3) loss of fracture toughness due to irradiation embrittlement and changes in material properties due to void swelling.

SRP-LR Section 3.1.2.2.3 states that certain aspects of neutron irradiation embrittlement are TLAAs as defined in 10 CFR 54.3 and that TLAAs are required to be evaluated in accordance with 10 CFR 54.21.(c)(1). Second, SRP-LR Section 3.1.2.2.3 states that 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 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to 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 B&W baffle/former bolts. Further staff evaluation is required for license renewal of all three aging effects.

The AMP recommended by the GALL Report for managing loss of fracture toughness due to neutron irradiation embrittlement in the reactor vessel is XI.M31, “Reactor Vessel Surveillance,” which complies with the requirements of 10 CFR Part 50, Appendices G and H, and 10 CFR Part 50.61.

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 is a TLAA, described in Section 4.2 of the FNP LRA. This TLAA is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

The applicant states that the reactor vessel surveillance program (FNP AMP B.3.4), as supported by associated TLAA evaluations (FNP LRA Section 4.2), will manage loss of fracture toughness of FNP 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 FNP LRA supplement letter dated December 5, 2003. This withdrawal schedule is reviewed by the NRR DE staff and is addressed in Section 3 of the SER related to the FNP LRA.

The applicant states that loss of fracture toughness due to neutron irradiation embrittlement and void swelling could occur in Westinghouse and Babcock & Wilcox (B&W) baffle/former assembly bolts. The GALL Report states that the applicant is to provide a plant-specific AMP to manage this potential aging effect. FNP is using the RVI program to manage the aging effect of the loss of fracture toughness due to neutron irradiation embrittlement and void swelling. FNP replaced the baffle/former assembly bolting pattern, required to ensure structural integrity of the baffle assemblies, in 1998/1999. Tensile testing and metallurgical examination of the removed strain-hardened stainless steel bolts indicated that no significant void swelling had occurred and that

adequate fracture toughness was retained. Due to the lower end of life fluence expected for these bolts and the operating history to date, no volumetric inspection of FNP baffle bolting is planned. The vessel internals program is reviewed by the NRR DE staff and is addressed in Section 3.0 of the SER related to the FNP LRA.

However, the applicant has made a commitment to continue participating in industry initiatives intended to qualify the aging effects of neutron irradiation embrittlement and void swelling. The project team informed the applicant that, if industry participation is to be used as a basis for determining whether inspections are necessary for monitoring these aging effects, a commitment is requested from the applicant to implement the program as recommended by Westinghouse, applicable Material Reliability Project Issue Task Groups (MRP ITGs), or other relevant industry organizations for management of these aging effects.

In response to the project team request, the applicant states that the Farley Nuclear Plant - License Renewal Future Action Commitment list will be revised to include the following revision to Item 6:

6.B) The applicant will submit an inspection plan for the RVI program for NRC review and approval 24 months prior to the first program inspections.

6.C) The applicant will continue to participate in industry initiatives intended to clarify the nature and extent of aging mechanisms potentially affecting the FNP reactor internals. The applicant will incorporate the results of these initiatives into the RVI program inspection requirements and acceptance criteria.

The commitments discussed in the applicant's response ensure that the applicant's inspection plan for the FNP RVIs will be submitted for staff review and approval 24 months prior to implementation. The allotted time for submittal of the inspection plan will provide the staff with the opportunity to resolve any differences between the staff and the applicant regarding the scope, inspection method techniques and qualifications, frequencies, and acceptance criteria for the RVI inspections proposed in the inspection plan.

By letter dated July 27, 2004 (ML042180163), the applicant added these commitments to its license renewal future action commitments list (Item No. 6).

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving management of 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.2.4 Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking (FNP LRA 3.1.2.2.4)

The project team reviewed FNP LRA Section 3.1.2.2.4 against the criteria contained in SRP-LR Section 3.1.2.2.4.

In the FNP LRA Section 3.1.2.2.4, the applicant addresses the potential for crack initiation and growth due to thermal and mechanical loading or stress corrosion cracking (SCC) (including intergranular stress corrosion cracking) that could occur in small-bore reactor coolant system and connected system piping less than 4-inch nominal pipe size (NPS 4).

SRP-LR Section 3.1.2.2.4 states that the GALL Report recommends that a plant-specific destructive examination or a NDE that permits inspection of the inside surfaces of the piping be conducted to ensure that cracking has not occurred and the component intended function will be maintained during the extended period. 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 the component's intended function will be maintained during the period of extended operation. Per ASME 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 AMPs recommended by the GALL Report are XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" to detect loss of material and XI.M2, "Water Chemistry" to mitigate SCC.

The applicant credits FNP AMP B.3.1, "Inservice Inspection Program," FNP AMP B.3.2, "Water Chemistry Control Program," and FNP AMP B.5.5, "One-Time Inspection Program," to manage the aging effects of cracking for small-bore RCS and connected systems piping. The project team evaluated these programs in Section 7.1.1, 7.1.2, and 7.1.14 of this report, 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 program for NRC approval in July 2003. By letter dated March 9, 2004, the staff approved the risk-informed ISI program. The risk-informed methodology will be used for selection of small bore Class 1 butt weld locations for the one-time volumetric examinations, but will not be used to eliminate the small bore Class 1 butt welds from the scope of these one-time examinations. During its review, the project team asked the applicant to provide the number of ASME Class 1 small bore piping weld locations that are in the scope of the LRA under risk-informed inservice inspection (RI-ISI) that will be volumetrically examined.

By letter dated July 9, 2004 (ML042010294), the applicant provides its response. In its response, the applicant states that the its RI-ISI program includes volumetric examination of one ASME Class 1 small bore (defined as piping less than 4-inch nominal size) piping segment per unit. Specifically, the 2-inch drain line that tees off of the 3-inch nominal letdown line in each unit. The applicant states 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 states 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 stress corrosion cracking) 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 project team finds that this line item is acceptable.

The project team finds that the applicant, based on the programs identified above, appropriately evaluated AMR results involving current inspection methods, as detailed in the inservice inspection program, and as supplemented by the water chemistry control and system leakage testing programs, for managing cracking of small bore piping systems.

On the basis of its review, the project team concludes that the applicant has appropriately evaluated AMR results involving management of crack initiation and growth due to thermal and mechanical loading or stress corrosion cracking for small-bore reactor coolant system and connected system piping, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.2.5 Crack Growth Due to Cyclic Loading (FNP LRA 3.1.2.2.5)

The project team reviewed FNP LRA Section 3.1.2.2.5 against the criteria in SRP-LR Section 3.1.2.2.5.

In the FNP LRA Section 3.1.2.2.5, the applicant addresses crack growth due to cyclic loading that could occur in reactor vessel shell and reactor coolant system piping and fittings.

SRP-LR Section 3.1.2.2.5 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 the ASME Section XI.

In Section 3.1.2.2.5 of the FNP LRA, the applicant stated that underclad cracking of reactor vessel and reactor coolant system clad alloy steel forgings is not a TLAA for FNP. The applicant stated that all clad alloy steel forgings are either not SA 508-Class 2 or they did not use a high input process for clad deposition. The reactor vessel shells were fabricated from SA-533, Grade B, plates. Moreover, no underclad cracking has been identified at FNP.

The project team reviewed Section 3.1.2.2.5 of the FNP 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. On that basis, the project team finds that this aging effect is not applicable to FNP.

7.2.1.2.6 Changes in Dimension due to Void Swelling (FNP LRA 3.1.2.2.6)

The project team reviewed FNP LRA Section 3.1.2.2.6 against the criteria in SRP-LR Section 3.1.2.2.6.

In the FNP LRA Section 3.1.2.2.6, the applicant addresses changes in dimension due to void swelling that could occur in reactor internal components.

SRP-LR Section 3.1.2.2.6 states that the GALL Report recommends that changes in dimension due to void swelling in reactor internal components be evaluated to ensure that this aging effect is adequately managed. The GALL Report recommends that a plant-specific AMP be evaluated to manage the effects of changes in dimension due to void swelling and the loss of ductility associated with swelling.

The applicant credits FNP AMP B.5.1, "Reactor Vessel Internals Program" to manage changes in material properties due to void swelling, which could occur in the PWR RVIs. The applicant states that this new program is consistent with GALL AMP XI.M16, "PWR Vessel Internals." FNP considers the baffle and former assemblies, including baffle/former bolting, to be leading indicators for void swelling.

FNP AMP B.5.1, "Reactor Vessel Internals Program" is reviewed by the NRR DE staff and is addressed in Section 3 of the SER related to the FNP LRA.

Furthermore, the applicant is committing to continue participating in industry initiatives intended to qualify the aging effects of void swelling. The project team informed the applicant that, if industry participation is to be used as a basis for determining whether inspections are necessary for monitoring of these aging effects, a commitment is requested from the applicant to implement the program as recommended by Westinghouse applicable MRP ITGs, or other relevant industry organizations for management of these aging effects.

The commitment ensures that the applicant's inspection plan for the FNP RVIs will be submitted for staff review and approval 24 months prior to implementation. The allotted time for submittal of the inspection plan will provide the staff with opportunity to resolve any differences between the staff and the applicant regarding the scope, inspection method techniques and qualifications, frequencies, and acceptance criteria for the RVI inspections proposed in the inspection plan.

The project team finds the applicant's approach for managing changes in dimension due to void swelling acceptable because the approach will be based on the guidelines developed by the ongoing industry activities related to void swelling, which manage changes in dimension and material properties. The applicant will develop and implement reactor vessel internal inspection program prior to the period of extended operation and will implement aging management activities that are acceptable to the project team. The applicant has agreed that this is a licensee commitment which has been evaluated under Section 7.2.1.2.3 of this report.

By letter dated July 27, 2004 (ML042180163), the applicant added these commitments to its license renewal future action commitments list (Item No. 6).

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving management of changes in dimension and material properties due to void swelling for the baffle and former plates, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.2.7 Crack Initiation and Growth due to Stress Corrosion Cracking or Primary Water Stress Corrosion Cracking (FNP LRA 3.1.2.2.7)

The project team reviewed FNP LRA Section 3.1.2.2.7 against the criteria in SRP-LR Section 3.1.2.2.7.

In FNP LRA Section 3.1.2.2.7, the applicant addresses (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; (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.

SRP-LR Section 3.1.2.2.7 states that

> 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 steam generator instruments and drains. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed. The GALL Report recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting crack initiation and growth due to SCC.
>
> Crack initiation and growth due to SCC could occur in CASS RCS piping and fittings and pressurizer surge line nozzle. The GALL Report recommends further evaluation of piping that does not meet either the reactor water chemistry guidelines of 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."
>
> 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 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 credits the following programs for each of the three SRP-LR criteria:

The use of a combination of water chemistry control program, NiCrFe component assessment program, and if augmented inspections are determined to be required, then inspections will be incorporated into the ISI program. The GALL AMP XI.M11, "Nickel-Alloy Nozzles and Penetrations" program for NiCr alloy material includes an assessment and use of ISI for inspection.

The use of 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.

These items are fabricated from stainless steel material, and therefore, this is not applicable to FNP.

The project team reviewed the plant-specific programs for these aging effects as documented:

The project team's evaluation of FNP AMP B.3.2, "Water Chemistry Control Program," is documented in Section 7.1.2 of this report.

The project team's evaluation of FNP AMP B.3.1, "Inservice Inspection Program," is documented in Section 7.1.1 of this report.

(1) Crack initiation and growth due to SCC and PWSCC

In Section 3.1.2.2.7.1 of the FNP LRA, the applicant includes two Nickel alloy components, core support lugs and bottom head penetrations. The applicant credits the (1) NiCrFe component assessment program (FNP AMP B.5.8), (2) water chemistry control program (FNP AMP B.3.2) and, (3) if augmented inspection requirements are determined to be required by the assessment, the inservice inspection program (FNP AMP B.3.1) to manage crack initiation and growth due to PWSCC of these components.

The staff's evaluation of FNP AMP B.5.8, "NiCrFe Component Assessment," is documented in Section 3 of the SER related to the FNP LRA.

The project team reviewed the water chemistry control program and the inservice inspection program and its evaluation are documented in Sections 7.1.1 and 7.1.2 of this report,

respectively. GALL AMP XI.M11, "Nickel-Alloy Nozzles and Penetrations" program for NiCr alloy material includes an assessment and use of the ISI program for inspection. The project team concludes that the NiCrFe component assessment program and the ISI 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, and therefore acceptable. Also, the project team concludes 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.

(2) Crack initiation and growth due to SCC

The applicant conservatively includes AMR of the pressurizer spray head by crediting the water chemistry control program (FNP AMP B.3.2) and the one-time inspection program (FNP 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 credits the water chemistry control program (FNP AMP B.3.2) to manage crack initiation and growth due to SCC in CASS reactor coolant system piping and fittings and pressurizer surge line nozzle. The program implements the guidance contained in EPRI TR-105714.

The project team reviewed this program and its evaluation of this program is documented in Section 7.1.2 of this report. Since the applicant's AMR for the CASS components indicates that the primary water chemistry is maintained in accordance with the chemistry guidelines of EPRI TR-105714, Revision 3, the project team concludes that the AMR for the CASS components is consistent with the GALL Report and is therefore acceptable.

(3) Crack initiation and growth due to PWSCC in pressurizer instrumentation penetrations and heater sheaths and sleeves made of nickel alloys.

The applicant states, in the FNP LRA, that the pressurizer instrumentation penetrations and heater sheaths are made of austenitic stainless steel and are not susceptible to PWSCC. The project team reviewed Section 3.1.2.2.7 of the FNP LRA and concludes that the pressurizer instrument penetrations and heater sheaths are fabricated from austenitic stainless steel and not nickel alloys and therefore, is acceptable.

On the basis of its review, the project team concludes that the applicant has adequately evaluated the management of crack initiation and growth due to SCC or PWSCC for components in the reactor systems, as recommended in the GALL Report. Based on this conclusion, and the confirmation that the remainder of the applicant's program is consistent with the GALL Report, the project team concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation.

7.2.1.2.8 Crack Initiation and Growth due to Stress Corrosion Cracking or Irradiation-Assisted Stress Corrosion Cracking (FNP LRA 3.1.2.2.8)

The project team reviewed FNP LRA Section 3.1.2.2.8 against the criteria in SRP-LR Section 3.1.2.2.8.

In FNP LRA Section 3.1.2.2.8, the applicant addresses crack initiation and growth due to SCC or IASCC that could occur in baffle/former assembly bolts in the reactor.

SRP-LR Section 3.1.2.2.8 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 credits FNP AMP B.5.1, "Reactor Vessel Internals Program," and FNP AMP B.3.2, "Water Chemistry Control Program," to manage these aging effects. The applicant states that these bolts were recently replaced. Testing of the replaced bolts indicated that no significant degradation had occurred. The applicant also states 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. The applicant states that it will continue to participate in industry activities coordinated by the Westinghouse Owner's Group (WOG) and MRP and will update this inspection program as appropriate based on the results of future research initiatives. The project team informed the applicant that, if industry participation is to be used as a basis for determining whether inspections are necessary for monitoring of these aging effects, the project team would require a commitment from the applicant to implement the program as recommended by the WOG, applicable MRP ITGs, or other relevant industry organizations for management of these aging effects.

The commitments ensure that the applicant's inspection plan for the FNP RVIs will be submitted for staff review and approval 24 months prior to implementation. The allotted time for submittal of the inspection plan will provide the staff with opportunity to resolve any differences between the staff and the applicant regarding the scope, inspection method techniques and qualifications, frequencies, and acceptance criteria for the RVI inspections proposed in the inspection plan.

By letter dated July 27, 2004 (ML042180163), the applicant added these commitments to its license renewal future action commitments list (Item No. 6).

The staff's evaluation of FNP AMP B.5.1, "Reactor Vessel Internals Program," is documented in Section 3 of the SER related to the FNP LRA and the project team's evaluation of FNP AMP B.3.2, "Water Chemistry Control Program," is documented in Section 7.1.2 of this report. The project team finds that the applicant, based on the programs identified above, appropriately

evaluated AMR results involving crack initiation and growth due to SCC or IASCC that could occur in baffle/former assembly bolts in the reactor.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving management of crack initiation and growth due to SCC or IASCC for the baffle and former plates, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.2.9 Loss of Preload due to Stress Relaxation (FNP LRA 3.1.2.2.9)

The project team reviewed FNP LRA Section 3.1.2.2.9 against the criteria in SRP-LR Section 3.1.2.2.9.

In the FNP LRA Section 3.1.2.2.9, the applicant addresses loss of preload due to stress relaxation that could occur in baffle/former assembly bolts in the reactor.

SRP-LR Section 3.1.2.2.9 states that loss of preload due to stress relaxation could occur in baffle/former assembly bolts. The GALL Report states that the applicant is to provide a plant-specific AMP to manage this potential aging effect.

The applicant credits FNP AMP B.5.1, "Reactor Vessel Internals Program," in combination with visual inspections performed under FNP AMP B.3.1, "Inservice Inspection Program," to manage the aging effect of loss of preload due to stress relaxation in baffle/former assembly bolts. The applicant states that these bolts were replaced at FNP and during the replacement project, no indications of significant stress relaxation were noted.

However, the applicant states that it will continue to participate in industry activities coordinated by the WOG and MRP and will update this inspection program as appropriate based on the results of future research initiatives. The project team informed the applicant that, if industry participation is to be used as a basis for determining whether inspections are necessary for monitoring of these aging effects, the project team would require a commitment from the applicant to implement the program as recommended by the WOG, applicable MRP ITGs, or other relevant industry organizations for management of these aging effects.

The commitments ensure that the applicant's inspection plan for the FNP RVIs will be submitted for staff review and approval 24 months prior to implementation. The allotted time for submittal of the inspection plan will provide the staff with opportunity to resolve any differences between the staff and the applicant regarding the scope, inspection method techniques and qualifications, frequencies, and acceptance criteria for the RVI inspections proposed in the inspection plan.

By letter dated July 27, 2004 (ML042180163), the applicant added these commitments to its license renewal future action commitments list (Item No. 6).

The staff's evaluation of FNP AMP B.5.1, "Reactor Vessel Internals Program," is documented in Section 3 of the SER related to the FNP LRA and the project team's evaluation of FNP AMP B.3.1, "Inservice Inspection Program," is documented in Section 7.1.1 of this report. The project team finds that the applicant, based on the programs identified above, appropriately evaluated AMR results involving visual inspection methods, as detailed in the inservice inspection program, and as supplemented by the RVI program, for managing preload due to stress relaxation that could occur in baffle/former assembly bolts in the reactor.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving management of 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.2.10 Loss of Section Thickness Due to Erosion (FNP LRA 3.1.2.2.10)

The project team reviewed FNP LRA Section 3.1.2.2.10 against the criteria in SRP-LR Section 3.1.2.2.10.

In the FNP LRA Section 3.1.2.2.10, the applicant addresses loss of section thickness due to erosion that could occur in SG feedwater impingement plates and supports.

SRP-LR Section 3.1.2.2.10 states that loss of section thickness due to erosion could occur at the feedwater impingement plate and support 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 states that it SGs have a recirculating feedring design that includes an elevated feedring and feedwater spargers. Impingement plates are not utilized. Therefore, loss of section thickness due to erosion of feedwater impingement plates and supports is not an aging effect requiring management at FNP.

7.2.1.2.11 Crack Initiation and Growth Due to Primary Water Stress Corrosion Cracking, Outside Diameter Stress Corrosion Cracking, 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 (FNP LRA 3.1.2.2.11)

The project team reviewed FNP LRA Section 3.1.2.2.11 against the criteria in SRP-LR Section 3.1.2.2.11.

In the FNP LRA Section 3.1.2.2.11, the applicant addresses 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 alloy components of the SG tubes and plugs.

SRP-LR Section 3.1.2.11 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 a SG degradation management program described in NEI 97-06; these guidelines are currently under NRC staff review. The GALL Report recommends that an AMP based on the recommendations of staff-approved NEI 97-06 guidelines, or other alternate regulatory basis for SG degradation management, should be developed to ensure that this aging effect is adequately managed.

To manage the effects of aging, the applicant credits the steam generator program (FNP AMP B.3.8) and the water chemistry control program (FNP AMP B.3.2). The applicant states that its SG program is based on the recommendations of staff-approved NEI 97-06 guidelines and is consistent with the GALL Report AMP XI.M19, “Steam Generator Tube Integrity.” The project team reviewed these programs and its evaluations are documented in Sections 7.1.6 and 7.1.2 of this report, respectively.

In Section 3.1.2.2.11 of the FNP LRA, the applicant states that degradation of the replacement steam generator thermally treated Alloy 690 tubes is not likely based on the improved materials of construction and design of the replacement Model 54F steam generators, but is conservatively considered in the AMR results. Steam generator tube sleeves and plugs have not been installed in the replacement steam generators. However, thermally treated Alloy 690 is the material of choice should any plugs or sleeves be installed. Loss of material due to pitting and wastage related to phosphate chemistry is not applicable. The applicant has not utilized phosphate chemistry. However, localized corrosion of the thermally treated Alloy 690 steam generator tubes is conservatively considered in the AMR results. The replacement steam generators 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 potential for denting is conservatively considered in the AMR results.

Based on the low likelihood of these aging effects occurring, and the fact that the applicant has conservatively considered these aging effects in the AMR evaluation, the project team concludes that the SG program and the water chemistry control program will effectively manage steam generator tube degradation.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.2.12 Loss of Section Thickness due to Flow-Accelerated Corrosion (FNP LRA 3.1.2.2.12)

The project team reviewed FNP LRA Section 3.1.2.2.12 against the criteria in SRP-LR Section 3.1.2.2.12.

In the FNP LRA Section 3.1.2.2.12, the applicant addresses loss of section thickness due to flow-accelerated corrosion (FAC) that could occur in SG tube support lattice bars made of carbon steel.

SRP-LR Section 3.1.2.2.12 states that loss of section thickness due to FAC could occur in tube support lattice bars made of carbon steel. The GALL Report recommends that a plant-specific aging management program be evaluated and, on the basis of the guidelines of NRC GL 97-06, an inspection program for SG internals be developed to ensure that this aging effect is adequately managed.

The applicant states that this aging effect is only applicable to Combustion Engineering (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 is not applicable to FNP.

On the basis that carbon steel tube support lattice bars are not part of the FNP SG design, the project team finds that this aging effect not applicable to FNP.

7.2.1.2.13 Ligament Cracking due to Corrosion (FNP LRA 3.1.2.2.13)

The project team reviewed FNP LRA Section 3.1.2.2.13 against the criteria in SRP-LR Section 3.1.2.2.13.

In the FNP LRA Section 3.1.2.2.13, the applicant addresses ligament cracking due to corrosion that could occur in carbon steel components in the SG tube support plate.

SRP-LR Section 3.1.2.2.13 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 a SG degradation management program described in NEI 97-06; these guidelines are currently under staff review. The GALL Report recommends that an AMP based on the recommendations of staff-approved NEI 97-06 guidelines, or other alternate regulatory basis for SG degradation management, be developed to ensure that this aging effect is adequately managed.

The applicant states that its SG tube support plates are fabricated from stainless steel and that this degradation mode is not applicable to FNP.

On the basis that carbon steel tube support plates are not part of the FNP SG design, the project team finds that this aging effect is not applicable to FNP.

7.2.1.2.14 Loss of Material due to Flow-Accelerated Corrosion (FNP LRA 3.1.2.2.14)

The project team reviewed FNP LRA Section 3.1.2.2.14 against the criteria in SRP-LR Section 3.1.2.2.14.

In the FNP LRA Section 3.1.2.2.14, the applicant addresses loss of material due to FAC that could occur in feedwater inlet rings and supports.

SRP-LR Section 3.1.2.2.14 states that 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, 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 that a plant-specific aging management program be evaluated because existing programs may not be capable of mitigating or detecting loss of material due to FAC.

The applicant states that its replacement SGs are of Westinghouse Model 54F replacement SG design for which this form of degradation has not been detected. Therefore, the applicant states that these components are not subject to this aging effect.

On the basis that the applicant's replacement SGs are of Westinghouse Model 54F replacement SG design, the project team finds that this aging effect is not applicable to FNP.

7.2.2 FNP LRA Section 3.2 - Aging Management of Engineered Safety Features Systems

In the FNP LRA Section 3.2, the applicant provides the results of its aging management reviews or in-scope components for the ESF systems.

In the FNP LRA Tables 3.2.2-1 through 3.2.2-3, the applicant provides a summary of the AMRs for component types associated with the following systems (1) containment spray, (2) containment isolation, and (3) emergency core cooling. The summary information for each component type includes: intended function; material; environment; aging effect requiring management; AMPs; the GALL Report Volume 2 item, cross referenced to FNP LRA Table 3.2.1; and, generic and plant-specific notes related to consistency with the GALL Report.

Also, the applicant identifies for each component type in FNP LRA Table 3.2.1 those components where further evaluation is recommended, those for which no further evaluation is required, and those that are not applicable to FNP together with the basis for their exclusion.

Additionally, the applicant identifies, in FNP LRA Tables 3.2.2-1 through 3.2.2-3, which AMR results it considers to be consistent with the GALL Report (table column Notes A through E) and which it justifies on a different basis.

The AMRs that are within the scope of the project team audit and review are those AMR results it considers to be consistent with the GALL Report (table column Notes A through E).

The project team conducted its audit and review in accordance with SRP-LR Section 3.2.3 and the FNP audit and review plan.

7.2.2.1 Aging Management Evaluations That Are Consistent With the GALL Report, for Which No Further Evaluation Is Required

For aging management evaluations that the applicant states are consistent with the GALL Report and for which further evaluation is not recommended, the project team conducted its audit and review to determine if the applicant's reference to the GALL Report in the FNP LRA is acceptable.

The project team reviewed the FNP LRA to confirm that the applicant (1) provides a brief description of the system, components, materials, and environment, (2) states that the applicable aging effects have been reviewed and are evaluated in the GALL Report, and (3) identifies those aging effects for the ESF system components that are subject to an AMR.

On the basis of its audit and review, the project team determined that for AMRs not requiring further evaluation, as identified in FNP LRA Table 3.2.1, are consistent with the GALL Report and are, therefore, acceptable.

7.2.2.2 Aging Management Evaluations That Are Consistent With the GALL Report, for Which Further Evaluation Is Recommended

For some line items consistent with the GALL Report in FNP LRA Tables 3.2.2-1 through 3.2.2-3, the GALL Report recommends further evaluation. When further evaluation is recommended, the project team reviewed these further evaluations provided in FNP LRA Section 3.2.2.2 against the criteria provided in SRP-LR Section 3.2.2.2. The following provides the project team's assessments of these evaluations. These project team assessments are applicable to each Table 2 line item in Section 3.2 citing the item in Table 1.

The FNP LRA sections, identified in FNP LRA Table 3.2.1, where further evaluation is recommended are discussed below.

7.2.2.2.1 Cumulative Fatigue Damage (FNP LRA 3.2.2.2.1)

FNP LRA Section 3.2.2.2.1 is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

7.2.2.2.2 Loss of Material Due to General Corrosion (FNP LRA 3.2.2.2.2)

The project team reviewed FNP LRA Section 3.2.2.2.2 against the criteria in SRP-LR Section 3.2.2.2.2.

In the FNP LRA Section 3.2.2.2.2, the applicant addresses loss of material due to general corrosion that could occur in the containment spray and ECCS and the external surfaces of carbon steel components.

SRP-LR Section 3.2.2.2.2 states that loss of material due to general corrosion could occur in the containment spray and ECCS and 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 states that the scope of components addressed by this aging effect discussion includes carbon steel components in the ECCS 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 credits FNP AMP B.5.5, "One-Time Inspection Program," for carbon steel components in an air/gas (wetted) environment and FNP AMP B.5.3, "External Surfaces Monitoring Program," for loss of material due to general corrosion for external surfaces of carbon steel components and bolting.

The project team evaluated FNP AMP B.5.5, "One-Time Inspection Program" and FNP AMP B.5.3, "External Surfaces Monitoring Program" and its evaluation of these AMPs are documented in Sections 7.1.14 and Section 7.1.12 of this report, respectively. The project team finds that the one-time inspection program includes components in the scope of inspection that

belong to these systems and the program will be consistent with GALL AMP XI.M33, "Selective Leaching of Materials." The external surfaces monitoring program scope includes components from these systems and depends on visual inspection to detect degradation. The project team concludes that the plant-specific program credited by the applicant for this line item is acceptable.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving 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 project team finds that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.3 Local Loss of Material Due to Pitting and Crevice Corrosion (FNP LRA 3.2.2.2.3)

The project team reviewed FNP LRA Section 3.2.2.2.3 against the criteria in SRP-LR Section 3.2.2.2.3.

In FNP LRA Section 3.2.2.2.3, the applicant addresses 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 the outer surface of the stainless steel refueling water storage tank (RWST).

SRP-LR Section 3.2.2.2.3 states that local loss of material from pitting and crevice corrosion could occur in the containment spray components, containment isolation valves and associated piping, the buried portion of the refueling water tank external surface. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The applicant states that the environments in the containment isolation system are dry gas and air/gas (wetted). Also, the applicant states that components exposed to a dry gas environment do not need an AMR for local loss of material due to pitting and crevice corrosion. For components in the containment isolation system with air/gas environment, the applicant credits FNP AMP B.5.5, "One-Time Inspection Program," with managing the aging effect of loss of material due to pitting and crevice corrosion.

The project team evaluated FNP AMP B.5.5, "One-Time Inspection Program" and its evaluation of this AMP is documented in Section 7.1.14 of this report. The project team concludes that the plant-specific program credited by FNP for this line item is acceptable.

In the FNP LRA, the applicant states that the stainless steel RWST is above ground so this aging mechanism is not applicable. The project team concurs with this conclusion.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving 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 project team finds that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.4 Local Loss of Material Due to Microbiologically Influenced Corrosion (FNP LRA 3.2.2.2.4)

The project team reviewed FNP LRA Section 3.2.2.2.4 against the criteria in SRP-LR Section 3.2.2.2.4.

In the FNP LRA Section 3.2.2.2.4, the applicant addresses local loss of material due to MIC.

SRP-LR Section 3.2.2.2.4 states that local loss of material due to MIC could occur in containment isolation valves and associated piping in systems that are not addressed in other chapters of the GALL Report. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The applicant states that the containment isolation system components that have an environment of treated water, raw water, or liquid waste are addressed as part of other systems. The components applicable to this line item are exposed to dry gas or an air/gas (wetted) environment. For these environments, loss of material due to MIC is not a valid aging effect.

On the basis that microbiological organisms need a water environment, and that the FNP components are exposed to dry gas or an air/gas environment, the project team finds that this aging effect is not applicable to FNP.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving 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 project team finds that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.5 Changes in Material Properties Due to Elastomer Degradation (FNP LRA 3.2.2.2.5)

The project team reviewed FNP LRA Section 3.2.2.2.5 against the criteria in SRP-LR Section 3.2.2.2.5.

In the FNP LRA Section 3.2.2.2.5, the applicant addresses the changes in properties due to elastomer degradation that could occur in seals associated with the standby gas treatment system ductwork and filters.

SRP-LR Section 3.2.2.2.5 states that the changes in properties due to elastomer degradation could occur in seals associated with the standby gas treatment system ductwork and filters. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The applicant states that this issue applies to boiling water reactors (BWRs) only and therefore, is not applicable to FNP. On the basis that this issue applies to BWRs only, the project team finds that this aging effect is not applicable to FNP.

7.2.2.2.6 Local Loss of Material Due to Erosion (FNP LRA 3.2.2.2.6)

The project team reviewed FNP LRA Section 3.2.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6.

In the FNP LRA Section 3.2.2.2.6, the applicant addresses local loss of material due to erosion that could occur in the high-pressure safety injection (HPSI) pump miniflow orifice.

SRP-LR Section 3.2.2.2.6 states that local loss of material due to erosion could occur in the HPSI 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 states, in the FNP LRA, 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 credits FNP AMP B.5.5, “One-Time Inspection Program,” as the plant-specific program that will manage this aging effect. The applicant also states that 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 one of the six orifices, which would be a good indicator for all the others.

The project team evaluated and accepted FNP AMP B.5.5, “One-Time Inspection Program” and evaluation of this AMP is documented in Section 7.1.14 of this report.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving management of 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 project team finds that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.7 Buildup of Deposits Due to Corrosion (FNP LRA 3.2.2.2.7)

The project team reviewed FNP LRA Section 3.2.2.2.7 against the criteria in SRP-LR Section 3.2.2.2.7.

In FNP LRA Section 3.2.2.2.7, the applicant addresses the plugging of components due to general corrosion that could occur in the spray nozzles and flow orifices of the drywell and suppression chamber spray system.

SRP-LR Section 3.2.2.2.7 states that the plugging of components due to general corrosion could occur in the spray nozzles and flow orifices of the drywell and suppression chamber spray system. This aging mechanism and effect will apply since the spray nozzles and flow orifices are occasionally wetted, even though the majority of the time this system is on standby. The wetting and drying of these components can aid in the acceleration of this particular corrosion. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The applicant states that this issue applies to BWRs only and therefore is not applicable to FNP.

On the basis that this issue applies to BWRs only, the project team finds that this aging effect is not applicable to FNP.

7.2.3 FNP LRA Section 3.3 - Aging Management of Auxiliary Systems

In the FNP LRA Section 3.3, the applicant provides the results of its aging management reviews for in-scope components for the auxiliary systems.

In the FNP LRA Tables 3.3.2-3 through 3.3.2-24, the applicant provides a summary of the AMRs for component types associated with the following systems (1) new fuel storage, (2) spent fuel storage, (3) spent fuel pool cooling and cleanup, (4) overhead heavy load handling, (5) open-cycle cooling water, (6) closed-cycle cooling water, (7) compressed air, (8) chemical and volume control, (9) control room area ventilation, (10) auxiliary and radwaste area ventilation, (11) primary containment heating, ventilation, and air conditioning (HVAC), (12) yard structures HVAC, (13) fire protection, (14) diesel fuel oil, (15) EDG, (16) demineralized water, (17) high energy line break detection, (18) hydrogen control, (19) liquid waste and drains, (20) oil-static cable pressurization, (21) potable and sanitary water; (22) radiation monitoring, (23) reactor makeup water storage, and (24) sampling. The summary information for each component type includes intended function; material; environment; aging effect requiring management; aging management programs; the GALL Report, Volume 2 item, cross reference to FNP LRA Table 3.3.1; and, generic and plant specific notes related to consistency with the GALL Report.

Also, the applicant identifies for each component type in FNP LRA Table 3.3.1 those components where further evaluation is recommended, those for which no further evaluation is required, and those that are not applicable to FNP together with the basis for their exclusion.

Additionally, the applicant identifies, in FNP LRA Tables 3.3.2-3 through 3.3.2-24, which AMR results it considers to be consistent with the GALL Report (table column Notes A through E) and which it justifies on a different basis.

The AMRs that are within the scope of the project team audit and review are those AMR results it considers to be consistent with the GALL Report (table column Notes A through E).

The project team conducted its audit and review in accordance with SRP-LR Section 3.3.3 and the FNP audit and review plan.

7.2.3.1 Aging Management Evaluations That Are Consistent With the GALL Report, for Which No Further Evaluation Is Required

For aging management evaluations that the applicant states are consistent with the GALL Report and for which further evaluation is not recommended, the project team conducted its audit and review to determine if the applicant's reference to the GALL Report in the FNP LRA is acceptable.

The project team reviewed the FNP LRA to confirm that the applicant (1) provides a brief description of the system, components, materials, and environment, (2) states that the applicable aging effects have been reviewed and are evaluated in the GALL Report, and (3) identifies those aging effects for the auxiliary system components that are subject to an AMR.

7.2.3.1.1 Loss of Material Due to Selective Leaching (FNP LRA Table 3.3.1, Item 3.3.1-29)

The project team reviewed Table 3.3.1, Item 3.3.1-29 and associated AMRs consistent with the GALL Report.

Column 8 of Table 2 (FNP LRA Tables 3.3.2-x), refers 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 addresses only CCW pumps fabricated from carbon steel. A RAI 3.3-4 was issued requesting the applicant to provide additional information on how selective leaching aging mechanisms are addressed for copper alloy (brass) and stainless steel materials in the components of the auxiliary systems. Further, the applicant was requested to describe the credited FNP program for the detection of the selective leaching of materials and compare it with GALL AMP X.M33, "Selective Leaching of Materials," for consistency determination.

By letter dated March 5, 2004 (ML040710873), the applicant submitted its response to RAI 3.3-4. In its response, the applicant states that there are inconsistencies in referencing (FNP 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. This inconsistency was a result of the way the GALL Report is structured and how the information from the GALL Report was transferred to the FNP LRA.

For example, in FNP LRA Table 3.3.2-5, the CCW heat exchanger (shell) line item is listed with a material of carbon steel, internal environment of closed cooling water, and an aging effect

requiring management of loss of material. This is a match for 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 provides a table summarizing the components in Table 3.3.2-x tables which are susceptible (potentially) to loss of material due to selective leaching. The project team reviewed the applicant's response and confirmed that these inconsistency were corrected.

The applicant credits FNP AMP B.5.5, "One-Time Inspection Program," for detection of selective leaching in potentially susceptible materials.

The project team evaluated FNP AMP B.5.5, "One-Time Inspection Program," and its evaluation for this AMP is documented in Section 7.1.14 of this report. In its evaluation, the project team concludes that this program is consistent with GALL AMP XI.M33 for detection of selective leaching.

The project team concludes that, based on the above discussion, the applicant has appropriately identified the components that are susceptible to the loss of material due to selective leaching and that the applicant has adequately described the AMP credited for managing the aging effects of the loss of materials due to selective leaching.

7.2.3.1.2 Open-Cycle Cooling Water System (FNP LRA Table 3.3.2-5)

The project team reviewed Table 3.3.2-5 of the FNP LRA which summarizes the results of the AMR evaluations in the SRP-LR for the auxiliary systems, open-cycle cooling water system.

Table 3.3.2-5 of the FNP LRA lists loss of material and fouling as aging effects for several components requiring aging management in the open-cycle cooling water system. The project team noted that fouling is generally an aging effect for heat transfer, not pressure boundary. The project team 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 provided its response to RAI 3.3-3. The applicant states that fouling is not related to the pressure boundary intended function of the channels heads, sheets, and tube sheets of the heat exchangers and coolers listed in Table 3.3.2-5 of the FNP LRA and therefore should not have been identified as an aging effect requiring management. The applicant states that there are no other changes to Table 3.3.2-5 of the FNP LRA result from removal of fouling from the table as an aging effect requiring management 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 project team reviewed the applicant's response and confirmed that fouling is removed as an aging effect requiring management for these components.

Based on its review and on the above discussion, the project team finds the applicant's response acceptable.

7.2.3.1.3 Diesel Fuel Oil System (FNP LRA Table 3.3.2-14)

The project team reviewed Table 3.3.2-14 of the FNP LRA which summarizes the results of the AMR evaluations in the SRP-LR for the auxiliary systems, diesel fuel oil system.

For the fuel oil storage and EDG day tanks in the fuel oil environment, the applicant, in Table 3.3.2-14 of the FNP LRA, credits the fuel oil chemistry control program (FNP AMP B.4.2) for managing the aging effect of the loss of material. It also references Table 3.3.1, Item 3.3.1-7 of the FNP LRA, which refers to Section 3.3.2.2.7 of the FNP LRA for further discussion. However, Section 3.3.2.2.7 of the FNP LRA stated that the fuel oil chemistry control program and one-time inspection program (FNP AMP B.5.5) will manage the loss of material in the fuel oil storage and day tanks. The project team questioned why the one-time inspection program was not listed in Table 3.3.2-14 line items.

The applicant indicated that this was an editorial error. The one-time inspection program should have been included with the fuel oil chemistry program in Table 3.3.2-14 of the FNP LRA. By letter dated May 28, 2004 (ML041560314), the applicant provided its response. In its letter, 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 program) should be listed in the aging management program column. The other table entries for the fuel oil environment remains unchanged. The staff's review of the one-time inspection program indicated that this component group was included in the scope of the one-time inspection program in Appendix B.5.5 of the FNP LRA. Therefore, project team concludes that Item Number 3.3.1-7 is consistent with the GALL Report.

7.2.3.1.4 Emergency Diesel Generator System (FNP LRA Table 3.3.2-15)

The project team reviewed Table 3.3.2-15 of the FNP LRA which summarizes the results of the AMR evaluations in the SRP-LR for the auxiliary systems, EDG system.

In Table 3.3.2-15 of the FNP LRA, the equipment frames and housings (crankcase ventilation) is defined in EDG system as being consistent with the GALL Report, Item VII.H2.4-a for material, environment, aging effects and AMPs.

The project team noted that the GALL Report item is for a different component. The material of the emergency diesel generator equipment frames and housings in FNP LRA Table 3.3.2-15 is cast iron in a wetted air environment. The material for the GALL Report, Item VII.H2.4-a is carbon steel in an environment with "hot diesel engine gases containing moisture and particulate." Therefore, the material and environment for the equipment frames and housings are different from the GALL Report, Item VII.H2.4-a for material and environment.

The project team issued RAI 3.3-5 requesting the applicant to justify the conclusion of being consistent with the GALL Report, determine whether the one-time inspection program is

applicable to the equipment frames and housings, and make any necessary changes to the table, if required.

By letter dated March 5, 2004 (ML040710873), the applicant provided its response to RAI 3.3-5. In its letter, the applicant stated that FNP LRA Section 3.0.2 provides the aging management strategy comparison with the GALL Report. In FNP LRA Section 3.0.2, the applicant states the GALL Report line item comparison is based fundamentally on the intent to manage aging. Section 3.0.3.4.2 of the FNP LRA states that: "The aging management line item comparison is performed with the goal of illustrating the best possible match between an FNP LRA Table 2 line item and the 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 also states that the cast iron component type in question, "equipment frames and housings (crankcase ventilation)," is part of the crankcase exhaust system on the EDGs. In FNP LRA Table 3.3.2-15, the cast iron crankcase component type is compared 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 agrees that the cast iron material is technically different from the GALL Report item of carbon steel material; therefore the use of Note C causes confusion. However, the GALL Report comparison information is provided only as a review aid. The applicant states no change to the AMR results (e.g., aging effects and AMPs) in Table 3.3.2-15 is required.

Based on its review of the applicant clarification, the project team finds that this line item is consistent with the GALL Report component line item selected for comparison.

On the basis of its review, the project team determined that for AMRs not requiring further evaluation, as identified in FNP LRA Table 3.3.1, are consistent with the GALL Report and are, therefore, acceptable.

7.2.3.2 Aging Management Evaluations That Are Consistent With the GALL Report, for Which Further Evaluation Is Recommended

For line items some consistent with the GALL Report in FNP LRA Tables 3.3.2-3 through 3.3.2-24, the GALL Report recommends further evaluation. When further evaluation is recommended, the project team reviewed these further evaluations provided in FNP LRA Section 3.3.2.2 against the criteria provided in SRP-LR Section 3.3.2.2. The following provides the project team's assessments of these further evaluations. These project team assessments are applicable to each Table 2 line item in Section 3.3 citing the item in Table 1.

The FNP LRA sections, identified in FNP LRA Table 3.3.1, where further evaluation is recommended are discussed below.

7.2.3.2.1 Loss of Material due to General, Pitting, and Crevice Corrosion (FNP LRA 3.3.2.2.1)

The project team reviewed FNP LRA Section 3.3.2.2.1 against the criteria in SRP-LR Section 3.3.2.2.1.

In FNP LRA Section 3.3.2.2.1, the applicant addresses loss of material in components of the spent fuel pool system.

SRP-LR Section 3.3.2.2.1 states that 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 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 program relies on monitoring and control of reactor water chemistry based on EPRI TR-105714 guidelines for primary water chemistry, 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, verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation. 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 states that FNP uses stainless steel material for this system, and therefore, this aging effect is not applicable to FNP.

On the basis that FNP uses stainless steel material for this system, the project team finds that this aging effect is not applicable to FNP.

7.2.3.2.2 Hardening and Cracking or Loss of Strength due to Elastomer Degradation or Loss of Material due to Wear (FNP LRA 3.3.2.2.2)

The project team reviewed FNP LRA Section 3.3.2.2.2 against the criteria in SRP-LR Section 3.3.2.2.2.

In FNP LRA Section 3.3.2.2.2, the applicant addresses the potential for degradation of elastomers in collars and seals in spent fuel pool cooling and ventilation systems.

SRP-LR Section 3.3.2.2.2 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 FNP LRA, for component type "compressible joints and seals," the applicant credits the one-time inspection program to manage the aging effects of change in material properties and loss of material. It also references Summary Table 1, Item 3.3.1-2, which refers to Section 3.3.2.2.2 for further discussion. However, in FNP LRA Section 3.3.2.2.2, the applicant states that the FNP external surfaces monitoring program will manage the applicable aging effects for this component type. The project team noted that it is not clear which AMP is credited.

In a supplemental response to RAI 3.3-6 dated May 28, 2004 (ML041560314), the applicant states that it revised the aging management strategy to credit FNP 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 due to 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 states that inclusion of 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 project team review of FNP AMP B.5.5, "One-Time Inspection Program," indicates that this component group is included in the scope of the one-time inspection program. The project team evaluated and accepted FNP AMP B.5.5, "One-Time Inspection Program." The evaluation for this AMP is documented in Section 7.1.14 of this report. Based on the above discussion, the project team finds FNP AMP B.5.5 is acceptable for managing these aging effects.

On the basis of its review, the project team 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.2.3 Cumulative Fatigue Damage (FNP LRA 3.3.2.2.3)

FNP LRA Section 3.3.2.2.3 is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

7.2.3.2.4 Crack Initiation and Growth Due to Cracking or Stress Corrosion Cracking (FNP LRA 3.3.2.2.4)

The project team reviewed FNP LRA Section 3.3.2.2.4 against the criteria in SRP-LR Section 3.3.2.2.4.

In the FNP LRA Section 3.3.2.2.4, the applicant addresses the potential for cracking in the high-pressure pumps of the chemical and volume control system.

SRP-LR Section 3.3.2.2.4 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 states that at FNP, these high-head pump casings are carbon steel with internal surfaces clad with austenitic stainless steel. Also, the normal operating temperature of these pumps is below the 140°F threshold for SCC. Therefore, the aging effect is not applicable to FNP.

On the basis that the normal operating temperature of these high-head pumps is below the 140°F threshold for SCC, the project team concurs that this aging effect is not applicable to FNP.

7.2.3.2.5 Loss of Material due to General, Microbiologically Influenced, Pitting, and Crevice Corrosion (LRA 3.3.2.2.5)

The project team reviewed FNP LRA Section 3.3.2.2.5 against the criteria in SRP-LR Section 3.3.2.2.5.

In FNP LRA Section 3.3.2.2.5, the applicant addresses the loss of material from corrosion that could occur on internal and external surfaces of components exposed to air and the associated range of atmospheric conditions.

SRP-LR Section 3.3.2.2.5 states that 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, in the piping of the diesel generator building ventilation system, in the above ground piping and fittings, valves, and pumps in the diesel fuel oil system and in the diesel engine starting air, combustion air intake, and combustion air exhaust subsystems in the EDG system. Loss of material due to (1) general, pitting, crevice, and MIC could occur in the duct fittings, access doors, and closure bolts, equipment frames and housing of the duct, (2) pitting and crevice corrosion could occur in the heating/cooling coils of the air handler heating/cooling, and (3) general corrosion could occur

on the external surfaces of all carbon steel SCs, 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.

The applicant credits FNP AMP B.5.5, "One-Time Inspection Program," to address loss of material due to corrosion of carbon and low alloy steel, including galvanized steel, in ventilation system components (air handling/cooling units), EDG intake components, and in EDG starting air components where the potential exists for significant condensation or pooling of water within the system. Additionally, a sample set of carbon steel components exposed to an air/gas environment will be performed as a part of the one-time inspection program to confirm that no significant corrosion is occurring within these components.

The applicant states, in the FNP LRA, that the EDG exhaust components and loss of material due to corrosion of the external surfaces of carbon steel components are managed by FNP AMP B.5.3, "External Surfaces Monitoring Program."

The project team reviewed FNP AMP B.5.5, "One-Time Inspection Program," and FNP AMP B.5.3, "External Surfaces Monitoring Program." Its evaluation is documented in Section 7.1.14 and Section 7.1.12 of this report, respectively. The project team finds these programs are 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.

In RAI 2.3.3.15-1, the NRR DSSA staff questioned why non-safety related air dryers/after coolers in the air start systems for the emergency diesel generators were not included within the scope of license renewal. In its response dated April 22, 2004 (ML041190361), the applicant states that the air dryer/after coolers assemblies are in the scope of license renewal and added the air dryers/after coolers to the EDG system aging management review summary Table 3.3.2-15. The project team reviewed the addition of these components subject to an aging management review and concludes that the addition of these components does not result in the addition of material/environment combinations or AMPs for the EDG system.

On the basis of its review, the project team 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.2.6 Loss of Material due to General, Galvanic, Pitting, and Crevice Corrosion (FNP LRA 3.3.2.2.6)

The project team reviewed FNP LRA Section 3.3.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6.

In FNP LRA Section 3.3.2.2.6, the applicant addresses further evaluation of programs to manage loss of material in the RCP oil collection system to verify the effectiveness of the fire protection program.

SRP-LR Section 3.3.2.2.6 states that 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 10 CFR 50, Appendix R, and Branch Technical Position 9.5-1 to manage loss of material from corrosion. However, corrosion may occur at locations where water from wash downs accumulates. Therefore, verification of the effectiveness of the program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage 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 credits the one-time inspection program (FNP AMP B.5.5) to manage loss of material due to corrosion on the internal surfaces components in the RCP oil collection system and to verify the effectiveness of the fire protection system.

The project team's evaluation of FNP AMP B.5.5, "One-Time Inspection Program," is documented in Section 7.1.14 of this report. Since the one-time inspection will focus on low points where water could accumulate, the project team finds this program acceptable to manage loss of material due to corrosion on the internal surfaces components in the RCP oil collection system. Also, the project team 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 is acceptable.

On the basis of its review, the project team 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.2.7 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion and Biofouling (FNP LRA 3.3.2.2.7)

The project team reviewed FNP LRA Section 3.3.2.2.7 against the criteria in SRP-LR Section 3.3.2.2.7.

In FNP LRA Section 3.3.2.2.7, the applicant addresses 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.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling could occur in the internal surfaces of tanks in the diesel fuel oil system and due to general, pitting, and crevice corrosion and MIC in the tanks of the diesel fuel oil system in the EDG system. The existing aging management program relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination in accordance with the guidelines of ASTM Standards D4057, D1796, D2709 and D2276, to manage loss of material due to corrosion or biofouling. Corrosion or biofouling may occur at locations where contaminants accumulate. Verification of the effectiveness of the fuel oil chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion/biofouling to verify the effectiveness of the program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The applicant credits FNP AMP B.4.2, "Fuel Oil Chemistry Control Program," and FNP AMP B.5.5, "One-Time Inspection Program," to manage the aging effects of loss of materials for diesel fuel oil tanks in the diesel fuel oil system, which is consistent with the GALL Report, with one exception. The applicant uses a different ASTM standard for fuel oil chemistry control program.

The project team finds the exception to use a different ASTM standard for fuel oil chemistry control program acceptable. The project team reviewed the exception concerning the ASTM standards, which the applicant uses in accordance with technical specification Section 5.5.13. The applicant tests for water and sediments, kinematic viscosity, insolubles and bacteria and fungi. The applicant does not test for particulates as required by the GALL Report. The project team determined that this exception is acceptable, since sediments are a good indicator of particulates and the standards and criteria used by the applicant are consistent with the technical specification requirements that are part of the CLB.

The project team's evaluation of FNP AMP B.4.2, "Fuel Oil Chemistry Control Program," and FNP AMP B.5.5, "One-Time Inspection Program," is documented in Section 7.1.8 and Section 7.1.14 of this report, respectively. The project team 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 project team finds that the applicant has appropriately evaluated AMR results involving management of the loss of material due to general, pitting, crevice, MIC, and biofouling, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.2.8 Quality Assurance For Aging Management of Non-safety-related Components (FNP LRA 3.3.2.2.8)

FNP LRA Section 3.3.2.2.8 is reviewed by the NRR DIPM staff and addressed in Section 4 of the SER related to the FNP LRA.

7.2.3.2.9 Crack Initiation and Growth due to Stress Corrosion Cracking and Cyclic Loading (FNP LRA 3.3.2.2.9)

The project team reviewed FNP LRA Section 3.3.2.2.9 against the criteria in SRP-LR Section 3.3.2.2.9.

In FNP LRA Section 3.3.2.2.9, the applicant addresses further evaluation of programs to manage cracking in the chemical and volume control system to verify the effectiveness of the water chemistry control program.

SRP-LR Section 3.3.2.2.9 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 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. Verification of the effectiveness of the chemistry control program should be performed 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 program. A one-time inspection of select 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 operations.

The applicant credits FNP AMP B.3.2, "Water Chemistry Control Program," to manage the aging effect of cracking. Furthermore, 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 project team finds this to be 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 captured in the commitment list nor in FNP LRA, Appendix A, for the UFSAR supplement.

The applicant states that it will revise the Farley Nuclear Plant - License Renewal Future Action Commitment list and include the following statement in Item 10, under specific components included in sample population:

> Reactor coolant system small bore (< 4 NPS), butt-welded piping (this inspection will serve as an indicator of the potential for SCC of other stainless steel components exposed to a borated water environment.)

The project team's evaluation of FNP AMP B.3.2, "Water Chemistry Control Program," is documented in Section of 7.1.2 of this report. The project team finds this program, in conjunction with the revised commitment, acceptable to manage the aging effects of loss of material for diesel fuel oil tanks in the diesel fuel oil system.

By letter dated July 27, 2004 (ML042180163), the applicant added this commitment to its license renewal future action commitments list (Item No. 10).

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving management of crack initiation and growth due to stress-corrosion cracking and cyclic loading, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.2.10 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion (FNP LRA 3.3.2.2.10)

The project team reviewed FNP LRA Section 3.3.2.2.10 against the criteria in SRP-LR Section 3.3.2.2.10.

In FNP LRA Section 3.3.2.2.10, the applicant addresses 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.

SRP-LR Section 3.3.2.2.10 states that 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 states that this line item applies to boral or boron steel panels in the spent fuel pool. FNP uses boraflex panels, hence this line item is not applicable to FNP.

On the basis that FNP uses boraflex panels in the spent fuel pool, the project team finds that this aging effect is not applicable to FNP.

7.2.3.2.11 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (FNP LRA 3.3.2.2.11)

The project team reviewed FNP LRA Section 3.3.2.2.11 against the criteria in SRP-LR Section 3.3.2.2.11.

In FNP LRA Section 3.3.2.2.11, the applicant addresses the potential for loss of material in buried piping of the service water and diesel fuel oil systems.

SRP-LR Section 3.3.2.2.11 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 (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. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components, ensuring that loss of material is not occurring.

The applicant states that the FNP AMR results are consistent with this summary item. The applicant credits FNP AMP B.5.4, "Buried Piping And Tank Inspection Program," to manage 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 project team evaluated and accepted FNP AMP B.5.4, "Buried Piping And Tank Inspection Program," and the evaluation is documented in Section 7.1.13 of this report. The project team also reviewed the effectiveness of the buried piping and tanks 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 project team reviewed the applicant 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 (open-cycle cooling water system) piping. The applicant attributed them to coating holidays or damage to the coating. However, leaks were detected prior to any loss of system function.

By letter dated August 31, 2004 (ML042530095), the applicant identified that the buried environment is also applicable to portions of buried carbon steel piping in the compressed air

system. The applicant stated that portions of the in-scope carbon steel piping from the FNP Unit 1 turbine building to the FNP Unit 2 auxiliary building are subject to aging management review, and the aging effect of loss of material is managed by the buried piping and tank inspection program.

On the basis of its review of the applicant's supplemental information, the project team finds that the applicant properly identified the buried carbon steel piping in the compressed air system as being subject to loss of material and managed by the buried piping and tank inspection program, and therefore, acceptable.

Based on its review of the inspection frequency, supplemental information, and operating experience, the project team finds the buried piping and tank inspection program adequately managed the potential for loss of material in buried piping of the service water, compressed air, and diesel fuel oil systems.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving the management of loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4 FNP LRA Section 3.4 - Aging Management of Steam and Power Conversion Systems

In FNP LRA Section 3.4, the applicant provides the results of its aging management reviews for in-scope components for the steam and power conversion systems.

In FNP LRA Tables 3.4.2-1 through 3.4.2-5, the applicant provides a summary of the AMRs for component types associated with the following systems (1) main steam, (2) feedwater, (3) SG blowdown, (4) auxiliary feedwater, and (5) auxiliary steam and condensate recovery. The summary information for each component type includes: intended function; material; environment; aging effect requiring management; AMPs; the GALL Report Volume 2 item; cross reference to FNP LRA Table 3.4.1; and, generic and plant specific notes related to consistency with the GALL Report.

Also, the applicant identifies for each component type in FNP LRA Table 3.4.1 those components where further evaluation is recommended, those for which no further evaluation is required, and those that are not applicable to FNP together with the basis for their exclusion.

Additionally, the applicant identifies, in FNP LRA Tables 3.4.2-1 through 3.4.2-5, which AMR results it considers to be consistent with the GALL Report (table column Notes A through E) and which it justified on a different basis.

The AMRs that are within the scope of the project team audit and review are those AMR results it considers to be consistent with the GALL Report (table column Notes A through E).

The project team conducted its audit and review in accordance with SRP-LR Section 3.4.3 and the FNP audit and review plan.

7.2.4.1 Aging Management Evaluations That Are Consistent With the GALL Report, for Which No Further Evaluation Is Required

For aging management evaluations that the applicant states are consistent with the GALL Report and for which further evaluation is not recommended, the project team conducted its audit and review to determine if the applicant's reference to the GALL Report in the FNP LRA is acceptable.

The project team reviewed the FNP LRA to confirm that the applicant (1) provides a brief description of the system, components, materials, and environment, (2) states that the applicable aging effects have been reviewed and are evaluated in the GALL Report, and (3) identifies those aging effects for the steam and power conversion systems components that are subject to an AMR.

On the basis of its audit and review, the project team determined that for AMRs not requiring further evaluation, as identified in FNP LRA Table 3.4.1, are consistent with the GALL Report and are, therefore, acceptable.

7.2.4.2 Aging Management Evaluations That Are Consistent With the GALL Report, for Which Further Evaluation Is Recommended

For some line items consistent with the GALL Report in FNP LRA Tables 3.4.2-1 through 3.4.2-5, the GALL Report recommends further evaluation. When further evaluation is recommended, the project team reviewed these further evaluations provided in FNP LRA Section 3.4.2.2 against the criteria provided in SRP-LR Section 3.4.2.2. The following provides the project team's assessments of these evaluations. These project team assessments are applicable to each Table 2 line item in Section 3.4 citing the item in Table 1.

The FNP LRA sections, identified in FNP LRA Table 3.4.1, where further evaluation is recommended are discussed below.

7.2.4.2.1 Cumulative Fatigue Damage (FNP LRA 3.4.2.2.1)

FNP LRA Section 3.1.2.2.1 is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

7.2.4.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion (FNP LRA 3.4.2.2.2)

The project team reviewed FNP LRA Section 3.4.2.2.2 against the criteria in SRP-LR Section 3.4.2.2.2.

In FNP LRA Section 3.4.2.2.2, the applicant addresses the GALL Report recommendation for further evaluation to verify the effectiveness of the water chemistry control program in managing loss of material due to general, pitting, and crevice corrosion.

SRP-LR Section 3.4.2.2.2 states that the management of loss of material due to general, pitting, and crevice corrosion should be evaluated further for 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 for loss of material due to pitting and crevice corrosion for stainless steel tanks and heat exchanger/cooler tubes. The water chemistry program relies on monitoring and control of water chemistry based on the guidelines in EPRI TR-102134 for secondary water chemistry in PWRs to manage the effects of loss of material due to general, pitting, or crevice corrosion. However, corrosion may occur at locations of stagnant flow conditions. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components and susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The AMP recommended by the GALL Report is XI.M32, "One Time Inspection," for management of this aging effect.

The applicant credits FNP AMP B.3.2, "Water Chemistry Control Program," for management of this aging effect and FNP AMP B.5.5, "One-Time Inspection Program," to verify the effectiveness of the water chemistry control program.

The project team finds that use of the one-time inspection program to verify the effectiveness of the water chemistry control program is consistent with the GALL Report and is acceptable. The project team evaluated and accepted FNP AMP B.3.2, "Water Chemistry Control Program," and FNP AMP B.5.5, "One-Time Inspection Program." The evaluation for these FNP AMPs is documented in Section 7.1.2 and Section 7.1.14 of this report, respectively.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.2.3 Loss of Material Due to General, Pitting, and Crevice Corrosion, Microbiologically Influenced Corrosion, and Biofouling (FNP LRA 3.4.2.2.3)

The project team reviewed FNP LRA Section 3.4.2.2.3 against the criteria in SRP-LR Section 3.4.2.2.3.

In FNP LRA Section 3.4.2.2.3, the applicant addresses loss of material in carbon steel piping and fittings exposed to untreated water from the backup water supply in the auxiliary feedwater system.

SRP-LR Section 3.4.2.2.3 states that loss of material due to general corrosion, pitting, and crevice corrosion, MIC, and biofouling could occur in carbon steel piping and fittings for untreated water from the backup water supply in the PWR auxiliary feedwater system. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

The applicant states that at FNP, the carbon steel AFW piping that is subject to general, pitting, and crevice corrosion, MIC, and biofouling is located in a cross-tie to the open-cycle cooling water system, which contains raw water. This open-water cooling water system cross-tie piping is separated from the auxiliary feedwater system by two locked closed valves. The applicant credits FNP AMP B.4.4, “Service Water Program,” to manage loss of material in this cross-tie piping.

The project team determined that the auxiliary feedwater 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 auxiliary feedwater system piping that are exposed to a raw water environment, its aging effect is managed by the service water program. The project team reviewed and concludes that the service water program is consistent with GALL Report AMP XI.M20 with acceptable enhancements (scope of the service water program will be enhanced to include inspection of piping from the main SW header to the air compressor and the service water pump columns) and can effectively manage the aging effects of loss of material. The project team’s evaluation of FNP AMP B.4.4, “Service Water Program,” is documented in Section 7.1.10 of this report.

On the basis of its review, the project team finds that the applicant appropriately evaluated the AMR results involving management of the loss of material due to general corrosion, pitting and crevice corrosion, MIC, and biofouling for auxiliary feedwater system components since the FNP auxiliary feedwater 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.2.4 General Corrosion (FNP LRA 3.4.2.2.4)

The project team reviewed FNP LRA Section 3.4.2.2.4 against the criteria in SRP-LR Section 3.4.2.2.4.

In FNP LRA Section 3.4.2.2.4, the applicant states that loss of material due to general corrosion could occur on external surfaces of carbon steel structures and components, including closure bolting.

SRP-LR Section 3.4.2.2.4 states that 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 that this aging effect is adequately managed.

The applicant credits FNP AMP B.5.3, "External Surfaces Monitoring Program," to manage loss of material on carbon steel component exterior surfaces subject to corrosion.

The project team finds that the loss of material due to general corrosion aging effect is managed consistent with the GALL Report. The project team accepted FNP AMP B.5.3, "External Surfaces Monitoring Program," and the evaluation for this AMP is documented in Section 7.1.12 of this report.

In RAI 2.3.4.4-1, the NRR DSSA staff questioned why the turbine lube oil subsystem and its components were not included within the scope of license renewal. In its response dated April 7, 2004 (ML041050600), the applicant states that several components related to the turbine lube oil subsystem were added to the scope of the AFW system. The project team reviewed the added components to FNP LRA Table 3.4.2-4 subject to an aging management review and concludes the addition of these components does not result in the addition of material/environment combinations or AMPs for the AFW system.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion (FNP LRA 3.4.2.2.5)

The project team reviewed FNP LRA Section 3.4.2.2.5 against the criteria in SRP-LR Section 3.4.2.2.5.

In FNP LRA Section 3.4.2.2.5, the applicant states 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.

SRP-LR Section 3.4.2.2.5 addresses 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 auxiliary feedwater system. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

SRP-LR Section 3.4.2.2.5 also addresses loss of material due to general corrosion, pitting and crevice corrosion, and MIC, which could occur in underground piping and fittings and emergency condensate storage tank in the auxiliary feedwater system and the underground condensate storage tank 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 loss of material from general corrosion, pitting and crevice corrosion, and MIC. The effectiveness of the buried piping and tank inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components, ensuring that loss of material is not occurring.

The applicant states that the loss of material was determined not to be an aging effect requiring management for the AFW system turbine lube oil cooling system. Water intrusion is not a credible occurrence since the system is closed. A review of FNP operating experience does not indicate any significant water intrusion events. The lube oil is cooled with treated water supplied from the FNP condensate storage tank. The applicant credits FNP AMP B.3.2, "Water Chemistry Control Program," and FNP AMP B.5.5, "One-Time Inspection Program," to manage aging of the lube oil heat exchanger components, such that the integrity of the lube oil system will be maintained.

The project team finds that FNP AMP B.3.2, "Water Chemistry Control Program," and FNP AMP B.5.5, "One-Time Inspection Program," adequately manage aging of the lube oil heat exchanger components. The project team evaluated and accepted these AMPs and the evaluation is documented in Section 7.1.2 and Section 7.1.14 of this report, respectively.

The applicant states that FNP condensate storage tank and AFW system piping are not buried. Therefore, the applicant determined that FNP components are not subject to the aging effect of loss of material in underground piping, fittings, and storage tanks.

The project team reviewed and confirmed that the FNP condensate storage tank and AFW system piping are not buried at FNP.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to loss of material due to general, pitting, crevice, and microbiologically influenced 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 project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5 FNP LRA Section 3.5 - Aging Management of Containments, Structures and Components Supports

In the FNP LRA Section 3.5, the applicant provides the results of its aging management reviews for in-scope SCs.

In FNP LRA Tables 3.5.2-1 through 3.5.2-9, the applicant provided a summary of the AMRs for component types associated with the following structures and commodities (1) PWR concrete containments, (2) auxiliary building, (3) diesel generator building, (4) turbine building, (5) utility/piping tunnels, (6) water control structures, (7) steel tank structures (foundations and retaining walls), (8) yard structures, and (9) component supports. The summary information for each component type includes: intended function; material; environment; aging effect requiring management; AMPs; the GALL Report Volume 2 item; cross reference to FNP LRA Table 3.5.1; and, generic and plant-specific notes related to consistency with the GALL Report.

Also, the applicant identifies for each component type in FNP LRA Table 3.5.1 those components where further evaluation is recommended, those for which no further evaluation is required, and those that are not applicable to FNP together with the basis for their exclusion.

Additionally, the applicant identifies, in FNP LRA Tables 3.5.2-1 through 3.5.2-9, which AMR results it considers to be consistent with the GALL Report (table column Notes A through E) and which it justifies on a different basis.

The AMRs that are within the scope of the project team audit and review are those AMR results it considers to be consistent with the GALL Report (table column Notes A through E).

The project team conducted its audit and review in accordance with SRP-LR Section 3.5.3 and the FNP audit and review plan.

7.2.5.1 Aging Management Evaluations That Are Consistent With the GALL Report, for Which No Further Evaluation Is Required

For aging management evaluations that the applicant states are consistent with the GALL Report and for which further evaluation is not recommended, the project team conducted its audit and review to determine if the applicant's reference to the GALL Report in the FNP LRA is acceptable.

The project team reviewed the FNP LRA to confirm that the applicant (1) provides a brief description of the system, components, materials, and environment, (2) states that the applicable aging effects have been reviewed and are evaluated in the GALL Report, and (3) identifies those aging effects for the containments, structures and components supports that are subject to an AMR.

7.2.5.1.1 Structures and Component Supports, PWR Concrete Containments – Summary of Aging Management Review (FNP LRA Table 3.5.2-1)

For internal structure steel liner component types, FNP LRA Table 3.5.2-1 credits the borated water leakage assessment and evaluation program to manage the aging effects of loss of material. It also references Item 3.5.1-20 from Table 3.5.1 of the FNP LRA. Item 3.5.1-20 states that the structural monitoring program will be credited for structural steel, but this program is not identified on Table 3.5.2-1 of the FNP LRA. 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. Therefore, the project team agrees and requested the applicant to confirm that the structural monitoring program is credited for structural steel.

The applicant confirmed, during the review, that the structural monitoring program should have been included in Table 3.5.2-1 of the FNP LRA and that the omission of the structural monitoring program in Table 3.5.2-1 of the FNP LRA was an editorial error.

By letter dated May 28, 2004 (ML041560314), the applicant provided its response. In its response, the applicant states that for internal structure steel liners components type, the structural monitoring program should be added to the aging management program column for managing loss of material.

The project team reviewed FNP AMP B.4.3, “Structural Monitoring Program,” and found that the structural steel component group was included in the scope of the program. The structural monitoring program is evaluated in Section 7.1.9 of this report. Based on the above discussion, the project team finds that this line item is acceptable.

On the basis of its audit and review, the project team determined that for AMRs not requiring further evaluation, as identified in FNP LRA Table 3.5.1, are consistent with the GALL Report and are, therefore, acceptable.

7.2.5.2 Aging Management Evaluations That Are Consistent With the GALL Report, for Which Further Evaluation Is Recommended

For some line items consistent with the GALL Report in FNP LRA Tables 3.5.2-1 through 3.5.2-9, the GALL Report recommends further evaluation. When further evaluation is recommended, the project team reviewed these further evaluations provided in FNP LRA Section 3.5.2.2 against the criteria provided in SRP-LR Section 3.5.2.2. The following provides

the project team's assessments of these evaluations. These project team assessments are applicable to each Table 2 line item in Section 3.5 citing the particular item in Table 1.

The FNP LRA sections, identified in FNP LRA Table 3.5.1 where further evaluation is recommended, are discussed below.

7.2.5.2.1 PWR Containments

The project team reviewed FNP LRA Section 3.5.2.2 against the criteria in SRP-LR Section 3.5.2.2, which addresses several areas discussed below.

7.2.5.2.1.1 Aging of Inaccessible Concrete Areas (FNP LRA 3.5.2.2.1)

The project team reviewed the FNP LRA Section 3.5.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.1.1.

In FNP LRA Section 3.5.2.2.1, the applicant addresses aging of inaccessible concrete areas for 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 AMP recommended by the GALL Report for managing the aging of the accessible portions of the containment structures is GALL AMP XI.S2, "ASME Section XI, Subsection IWL." The applicant addresses this with FNP AMP B.3.1, "Inservice Inspection Program," which is evaluated in Section 7.1.1 of this report. Subsection IWL exempts from examination those portions of the concrete containment that are inaccessible (e.g., foundation, below-grade exterior walls, or concrete covered by liner).

The applicant also uses FNP AMP B.4.3, "Structural Monitoring Program" where accessible areas are monitored for evidence of aging effects that may be applicable to containment structures. This program, which is consistent with GALL AMP XI.S6, "Structures Monitoring Program," is evaluated in Section 7.1.9 of this report. The structural monitoring program will be enhanced to include the examination of below-grade concrete of in-scope structures that are currently not monitored when they are exposed by excavation.

In the GALL Report, Volume 2, Chapter II, Table A1 (as modified by ISG-3), further evaluation is recommended 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 due to these five aging mechanisms are cracking, change in material properties, and loss of material.

(1) Freeze-thaw

SRP-LR Section 3.5.2.2.1.1 does not address freeze-thaw as an aging mechanism for concrete containments because no further evaluation is recommended in the GALL Report. However, ISG-3 clarifies the staff 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 reviewed and confirmed that the aging mechanism has not caused degradation of the concrete.

The applicant states that FNP is located in a region considered to be subject to moderate weathering conditions. In the FNP LRA, the applicant notes that FNP is close to the region of negligible weathering conditions and is not exposed to saturated water conditions. The applicant also states 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, which provides a good quality, dense, low permeability concrete. This results in dense concrete of good quality and low permeability with resistance to aggressive chemical solutions by requiring the following:

high cement content
low water-to-cement ratio
proper curing
adequate air entrainment

The project team reviewed relevant operating experience to confirm that loss of material from freeze-thaw has not been observed, either through the ISI program or the structural monitoring program.

On the basis that concrete that satisfies the requirements of ACI 318-63 will meet the guidelines of ISG-3, and on the basis of an audit of operating experience evaluated under the ISI and structural monitoring programs, the project team finds that loss of material and cracking due to freeze-thaw will be adequately managed by the inservice inspection program.

(2) Leaching of calcium hydroxide

SRP-LR Section 3.5.2.2.1.1 states that cracking, spalling, and increases in porosity and permeability due to 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, has low permeability, and that cracking is well controlled.

In the FNP LRA, the applicant states that its concrete structures are designed in accordance with specification ACI 318-63.

On the basis that ACI 318-63 provides assurance that the criteria of the GALL Report and ISG-3 are met and that leaching of calcium hydroxide is not significant at FNP, the project team concludes that the ISI (IWL) program is sufficient for management of increases in porosity and permeability from this aging mechanism. A plant-specific aging management program is not required to address this aging effect.

(3) Aggressive chemical attack

SRP-LR Section 3.5.2.2.1.1 states that cracking, spalling, and increases in porosity and permeability due to 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 ppm, or sulfates are greater than 1500 ppm. ISG-3 also states that a plant specific program is required to examine representative samples of below-grade concrete when excavated for any reason.

FNP is not located in areas exposed to sulfate or chloride attack, nor is it located near industrial plants whose emissions would change environmental parameters and cause degradation to concrete. The project team reviewed and confirmed from water chemical analysis results that the site ground water is not aggressive. Historical results are presented in FNP UFSAR Table 2.4 7. 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, the applicant uses the structural monitoring program for the examination of below-grade concrete when it is exposed by excavation.

On the basis of the information provided in the FNP LRA and the guidelines provided in the SRP-LR, the GALL Report, and ISG-3; the project team finds that increases in porosity and permeability, loss of material (spalling, scaling) and cracking due to aggressive chemical attack are not significant for concrete in inaccessible areas. The project team finds that a plant-specific program for examination of below-grade concrete is not required.

(4) Reaction with aggregates

SRP-LR Section 3.5.2.2.1.1 does not address reaction with aggregates as an aging mechanism for concrete containments because no further evaluation is recommended in the GALL Report.

However, ISG-3 clarifies the staff position that further evaluation is appropriate if investigations, tests, or examinations have demonstrated that the aggregates are reactive.

In the FNP LRA, the applicant states that FNP concrete structures are designed in accordance with specification 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 interviews with the applicant's technical staff, the project team confirmed that the petrographic test results showed that the aggregates used for concrete containment at FNP are not reactive and therefore, further evaluation is not required to address this aging effect.

(5) Corrosion of embedded steel

SRP-LR Section 3.5.2.2.1.1 states that loss of material due to 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) due to corrosion of embedded steel, the GALL Report states that a plant-specific program is only required if the below-grade environment is aggressive. ISG-3 also states that a plant specific program is required to examine representative samples of below-grade concrete when excavated for any reason.

In the FNP LRA, the applicant states that water chemical analysis results show that the site groundwater is not aggressive. Historical results are presented in FNP UFSAR Table 2.4 7. Results from sample testing performed in 2003 are: pH values between 6.68 and 7.14, chloride values between 2.00 and 3.74 ppm, and sulfate values between 5.25 ppm and 6.37 ppm. In addition, the applicant uses the structural monitoring program for the examination of below-grade 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 project team reviewed Section 3.5.2.2.1 of the FNP LRA and determined that the site groundwater environment is not aggressive and subsequent sampling showed that results have remained within the limits identified in the GALL Report. The project team finds that in accordance with the criteria in the GALL Report, because the aggregates are not reactive and the groundwater environment is not aggressive, this aging effect is not significant and is adequately managed.

The project team reviewed the results of the applicant's AMR for inaccessible concrete areas. On the basis of its review as discussed above, the project team finds that the applicant appropriately evaluated AMR results involving management of aging of inaccessible concrete areas for containment, as recommended in the GALL Report and ISG-3.

On the basis of its review, the project team concludes that the applicant appropriately evaluated AMR results involving management of aging of inaccessible concrete areas for containment, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.1.2 Cracking, Distortion, and Increase in Component Stress Level Due to Settlement; Reduction of Foundation Strength Due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program (FNP LRA 3.5.2.2.2)

The project team reviewed FNP LRA Section 3.5.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.1.2.

In FNP LRA Section 3.5.2.2.2, the applicant addresses (1) cracking, distortion and increase in component stress level due to settlement and (2) reduction of foundation strength due to erosion of porous concrete subfoundations in the containment. The applicant uses FNP AMP B.4.3, "Structural Monitoring Program" to manage this aging effect. This program, which is consistent with GALL AMP XI.S6, "Structures Monitoring Program," is evaluated in Section 7.1.9 of this report.

SRP-LR Section 3.5.2.2.1.2 states that cracking, distortion, and increase in component stress level due to settlement could occur in PWR concrete and steel containments. Also, reduction of foundation strength due to erosion of porous concrete subfoundations could occur in all types of PWR containments. Some plants may rely on a de-watering system to lower the site ground water level. If the plant's CLB credits a de-watering system, the GALL Report recommends verification of the continued functionality of the de-watering system during the period of extended operation. The GALL Report recommends no further evaluation if this activity is included 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 FNP LRA, the applicant states that it does not rely on a de-watering system for control of settlement. The containment foundation is constructed directly on bedrock (Lisbon formation) and is not subject to settlement. The applicant states in FNP UFSAR Section 2B.7.3.1 that no indication of settlement has been detected from the monitoring of settlement of structures. Groundwater was not aggressive during plant construction and no changes in groundwater conditions have been observed. Finally, the applicant has included these components within the plant-specific structural monitoring program, which will confirm that these aging effects are

adequately managed and no further evaluation is necessary as recommend by the GALL Report.

The project team reviewed the AMR results involving management of aging effects resulting from settling and erosion of porous concrete subfoundations and confirmed that the structural monitoring program addresses each of the affected SCs.

On the basis of its review, the project team finds that the applicant has appropriately evaluated 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. Since the applicant's AMR results are other wise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.1.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature (FNP LRA 3.5.2.2.3)

The project team reviewed FNP LRA Section 3.5.2.2.3 against the criteria in SRP-LR Section 3.5.2.2.1.3.

In FNP LRA Section 3.5.2.2.3, the applicant addresses reduction of strength and modulus of concrete structures due to elevated temperature in containments.

SRP-LR Section 3.5.2.2.1.3 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 aging management program 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 FNP LRA, the applicant states 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 credits FNP AMP B.4.3, "Structural Monitoring Program" to manage this aging effect. This program, which is consistent with GALL AMP XI.S6, "Structures Monitoring Program," is evaluated in Section 7.1.9 of this report. The program has been enhanced to monitor aging effects attributable to elevated temperatures.

Standard ACI-318 provides a maximum temperature limit of 150°F for liquid, gas, or vapor in embedded piping in structural concrete. ASME Code Section III, Division 2, and ACI-349.3R-96, "Code Requirement for Nuclear Safety-Related Concrete Structures," provide limits where exposure to high temperatures could impair the concrete. ASME Code Section III, Division 2, Subsection CC, 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 are allowed to have increased temperatures not exceeding 200°F. ACI-349 allows local area temperatures to 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 and this reduction is applied to the design allowable limit.

In 1997, the applicant proposed to increase the allowable reactor vessel concrete support temperature from 130°F to 190°F. The NRC raised a concern about exceeding the 150°F limit. Recognizing the potential degradation of the reactor pressure vessel supports (RPVS) subjected to sustained temperatures higher than 150°F, the applicant committed to inspect the structural components, including portions of the RPVS in the containment building, as part of the maintenance rule structural monitoring program. This program will ensure that significant cracking of RPVS that could affect the structural support of the reactor vessel 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 states 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 structural monitoring program has been enhanced to include inspection requirements for containment internal concrete for monitoring aging effects due to elevated temperature.

The project team reviewed the FNP LRA and UFSAR supplement, and determined that (1) the applicant has identified areas where localized temperature could exceed 150°F and has committed to an aging management program, (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 structural monitoring program is enhanced to include inspection requirements for containment concrete where the temperatures could exceed specified limits. On this basis, the project team finds that the applicant has implemented adequate procedures for managing containment concrete degradation induced by elevated temperature.

On the basis of its review, the project team finds that the applicant has appropriately evaluated 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. Since the applicant's AMR results are other wise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.1.4 Loss of Material Due to Corrosion in Inaccessible Areas of Steel Containment Shell or Liner Plate (FNP LRA 3.5.2.2.4)

The project team reviewed FNP LRA Section 3.5.2.2.4 against the criteria in SRP-LR Section 3.5.2.2.1.4.

In FNP LRA Section 3.5.2.2.4, the applicant addresses the aging effect of loss of material due to corrosion in inaccessible areas of steel containment shell or liner plate.

SRP-LR Section 3.5.2.2.1.4 states that loss of material due to 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 the following specific criteria defined in the GALL Report cannot be satisfied: (1) concrete meeting the requirements of ACI 318 or 349 and the guidance of 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; (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 FNP LRA, the applicant states that corrosion for 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 concrete is monitored under the maintenance rule structural monitoring program and the ISI program, ASME Section XI, Subsection IWL to ensure that it is free of penetrating cracks. The moisture barrier is monitored under the ISI program, ASME Section XI, Subsection IWE 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 project team reviewed plant operating experience and confirmed that there is no significant corrosion in the accessible areas of the containment liner plate. The project team noted that (1) the applicant’s inspection did not find significant corrosion in the accessible portion of the containment liner plate; (2) the applicant credits its ISI program, ASME Section XI, Subsection IWE 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 project team finds that the applicant has appropriately evaluated AMR results involving management of loss of material due to corrosion in inaccessible areas of steel containment liner plate for containment components, as recommended in the GALL Report.

Since the applicant's AMR results are other wise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.1.5 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature (FNP LRA 3.5.2.2.5)

FNP LRA Section 3.5.2.2.5 is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

7.2.5.2.6 Cumulative Fatigue Damage LRA (FNP LRA 3.5.2.2.6)

FNP LRA Section 3.5.2.2.6 is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

7.2.5.2.1.7 Cracking due to Cyclic Loading and SCC (FNP LRA 3.5.2.2.7)

The project team reviewed FNP LRA Section 3.5.2.2.7 against the criteria in SRP-LR Section 3.5.2.2.1.7.

In FNP LRA Section 3.5.2.2.1.7, the applicant addresses the aging effects of cracking due to cyclic loading and SCC.

SRP-LR Section 3.5.2.2.7 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. Further evaluation of inspection methods is recommended to detect cracking due to cyclic loading and SCC since visual examinations (VT-3) may be unable to detect this aging effect.

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). 10 CFR 50.55a identifies examination categories E-B and E-F as optional during the current term of operation. For the extended period of 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 to address this issue.

The applicant states that penetration sleeves and bellows are considered part of ASME Section XI, Subsection IWE, pressure boundary and both the ASME Section XI, Subsection IWE, and the 10 CFR 50, Appendix J portions of the ISI program perform inspections of these component types. The applicant credits the inservice inspection program (FNP AMP B.3.1) to manage cracking for this component/commodity group. The project team reviewed this program and its evaluation is documented in Section 7.1.1 of this report.

The applicant states that SCC is not an applicable aging mechanism for carbon steel, from which the penetration sleeves are made. No dissimilar metal welds were identified that require aging management under this grouping. For stainless steel, SCC requires both high temperature and exposure to an aggressive environment to occur, and the bellows are not exposed to an aggressive environment. The applicant states that it has not experienced SCC in these components.

The project team finds that since 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 project team finds that the applicant appropriately evaluated AMR results involving management of cracking of containment penetrations (including penetration sleeves, penetration bellows, and dissimilar metal welds) due to cyclic loading and SCC, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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).

7.2.5.2.2 Class 1 Structures

The project team reviewed FNP LRA Section 3.5.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.2, which addresses several areas discussed below.

7.2.5.2.2.1 Aging of Structures not Covered by Structures Monitoring Program (FNP LRA 3.5.2.2.8)

The project team reviewed FNP LRA Section 3.5.2.2.8 against the criteria in SRP-LR Section 3.5.2.2.2.1.

In FNP LRA Section 3.5.2.2.2.1, the applicant addresses aging of Class 1 structures not managed by the structural monitoring program.

SRP-LR Section 3.5.2.2.8 states that the GALL Report recommends further evaluation of certain structure/aging effect combinations if they are not covered by the structures monitoring program. This includes (1) scaling, cracking, and spalling due to repeated freeze-thaw for Groups 1-3, 5, 7-9 structures; (2) scaling, cracking, spalling and increase in porosity and permeability due to leaching of calcium hydroxide and aggressive chemical attack for Groups 1-5, 7-9 structures; (3) expansion and cracking due to reaction with aggregates for Groups 1-5, 7-9 structures; (4) cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel for Groups 1-5, 7-9 structures; (5) cracks, distortion, and increase in component stress level due to settlement for Groups 1-3, 5, 7-9 structures; (6) reduction of foundation strength due to erosion of porous concrete subfoundation for Groups 1-3, 5-9 structures; (7) loss of material due to

corrosion of structural steel components for Groups 1-5, 7-8 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 states that all FNP in-scope structures are managed by FNP AMP B.3.1, "Inservice Inspection Program," and FNP AMP B.4.3, "Structural Monitoring Program." These programs are evaluated and accepted in Section 7.1.1 and 7.1.9 of this report, respectively. All the aging effects (e.g., cracking, loss of material, change in material properties) are identified by these programs irrespective of the mechanisms which caused it.

Since all FNP structures are managed either by the ISI program and structural monitoring program, the project team finds that the applicant has adequately addressed aging of structures not covered by the structural monitoring program.

On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving management of aging of structures not covered by structures monitoring program for Class I structures, as recommended in the GALL Report. Since the applicant's AMR results are otherwise consistent with the GALL Report, the project team 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.2.2 Aging Management of Inaccessible Areas (FNP LRA 3.5.2.2.9)

The project team reviewed FNP LRA Section 3.5.2.2.9 against the criteria in SRP-LR Section 3.5.2.2.2.2.

In FNP LRA Section 3.5.2.2.9, the applicant addresses aging management of inaccessible areas of Class 1 structures.

SRP-LR Section 3.5.2.2.2.2 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 due to corrosion of embedded steel could occur in below-grade inaccessible concrete areas. The GALL Report recommends further evaluation to manage these aging effects in inaccessible areas of Groups 1-3, 5, 7-9 structures, if specific criteria defined in the GALL Report cannot be satisfied. ISG-3 identifies 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. ISG-3 also states that a plant specific program is

required to examine representative samples of below-grade concrete when excavated for any reason.

The applicant states 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 project team agrees with the applicant and its evaluation of aging management of inaccessible areas for containment components is addressed in Section 7.2.5.2.1.1 of this report.

7.2.5.2.3 Component Supports

The project team reviewed FNP LRA Section 3.5.2.2 against the criteria in SRP-LR Section 3.5.2.2, which addresses several areas discussed below.

7.2.5.2.3.1 Aging of Supports not Covered by Structural Monitoring Program (FNP LRA 3.5.2.2.10)

The project team reviewed FNP LRA Section 3.5.2.2.10 against the criteria in SRP-LR Section 3.5.2.2.3.1.

In FNP LRA Section 3.5.2.2.10, the applicant addresses aging of supports not managed by the FNP structural monitoring program.

SRP-LR Section 3.5.2.2.3.1 states that the GALL Report recommends further evaluation of certain component support/aging effect combinations if they are not covered by the structures monitoring program. This includes (1) 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 due to degradation of vibration isolation elements, for Group B4 supports. Further evaluation is necessary only for structure/aging effect combinations not covered by the structures monitoring program.

The applicant states that the FNP structural monitoring program, evaluated in Section 7.1.9 of this report, is applicable to all components in Groups B2 through B5. No further evaluation is required for these. The component supports in Group B1 are managed by the ISI program, ASME Section XI, Subsection IWF, evaluated in Section 7.1.1 of this report. The applicant also states that the ISI program is consistent with GALL AMP XI.S3, “ASME Section XI, Subsection IWF.”

The project team 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 project team finds the ISI program to be a satisfactory alternative to the structural monitoring program.

On the basis of the discussion above, the project team finds that the applicant appropriately evaluated AMR results involving management of structures not covered by the structural monitoring program, as recommended in the GALL Report. The project team 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).

7.2.5.2.3.2 Cumulative Fatigue Damage (FNP LRA 3.5.2.2.11)

Cumulative fatigue damage is a TLAA that is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

7.2.6 FNP LRA Section 3.6 - Aging Management of Electrical and Instrumentation and Controls

In FNP LRA Section 3.6, the applicant provides the results of its AMRs for in-scope components for electrical and instrumentation and controls (I&C).

In FNP LRA Table 3.6.2-1, the applicant provides a summary of the AMRs for component types associated with electrical and I&C components. The summary information for each component type includes: intended function; material; environment; aging effect requiring management; AMPs; the GALL Report Volume 2 item; cross reference to FNP LRA Table 3.6.1; and, generic and plant specific notes related to consistency with the GALL Report.

Also, the applicant identifies for each component type in FNP LRA Table 3.6.1 those components where further evaluation is recommended, those for which no further evaluation is required, and those that are not applicable to FNP together with the basis for their exclusion.

Additionally, the applicant identified, in FNP LRA Table 3.6.2-1, which AMR results it considers to be consistent with the GALL Report (table column Notes A through E) and which it justified on a different basis.

The AMRs that are within the scope of the project team audit and review are those AMR results it considers to be consistent with the GALL Report (table column Notes A through E).

The project team conducted its audit and review in accordance with SRP-LR Section 3.6.3 and the FNP audit and review plan.

7.2.6.1 Aging Management Evaluations That Are Consistent With the GALL Report, for Which No Further Evaluation Is Required

For aging management evaluations that the applicant states are consistent with the GALL Report and for which further evaluation is not recommended, the project team conducted its audit and review to determine if the applicant's reference to the GALL Report in the FNP LRA is acceptable.

The project team reviewed the FNP LRA to confirm that the applicant (1) provides a brief description of the system, components, materials, and environment, (2) states that the applicable aging effects have been reviewed and are evaluated in the GALL Report, and (3) identifies those aging effects for the electrical and instrumentation and controls components that are subject to an AMR.

On the basis of its audit and review, the project team determined that for AMRs not requiring further evaluation, as identified in FNP LRA Table 3.6.1, are consistent with the GALL Report and are, therefore, acceptable.

7.2.6.2 Aging Management Evaluations That Are Consistent With the GALL Report, for Which Further Evaluation Is Recommended

For some line items consistent with the GALL Report in FNP LRA Table 3.6.2-1, the GALL Report recommends further evaluation. When further evaluation is recommended, the project team reviewed these further evaluations provided in FNP LRA Section 3.6.2.2 against the criteria provided in the SRP-LR Section 3.6.2.2. The following provides the project team's assessments of these evaluations. These project team assessments are applicable to each Table 2 line item Section 3.6 citing the item in Table 1.

The FNP LRA sections, identified in FNP LRA Table 3.6.1, where further evaluation is recommended is discussed below.

7.2.6.2.1 Electrical Equipment Subject to Environmental Qualification (FNP LRA 3.6.2.2.1).

FNP LRA Section 4.4 addresses this item which is reviewed by the NRR DE staff and addressed in Section 4 of the SER related to the FNP LRA.

Farley A&R Report
Attachment 1

Project Team and Applicant Personnel

LRA Review Project Team

K. Chang, NRC Team Leader *
K. Cozens, NRC
N. Dudley, NRC
M. Lintz, NRC
B Gitnick, ISL, ISL Lead
S. Pope, ISL
F. Saba, ISL
R. Chhina, ISL
J. Leivo, ISL
E. Patel, ISL *

Project Team Support

S. West, RLEP, Section B *
T. Liu, NRC, FNP LR Project Manager *
G. Suber, NRC, RLEP
D. Guha, NRC RLEP
J. Medoff, NRC DE
D. Nguyen, NRC DE
J. Strnisha, NRC DE

Applicant Personnel Contacted

J. M. Agold
W. Evans *
J. Fridrichson *
B. J. George
P. S. Ghosal
R. Hill
L. Long
P. Wolfinger
M. Macfarlane *
B. D. McKinney
R. Mullins
W. Orr
C. Pierce *
D. Stevens
L. M. Stinson

*Attended the Public Exit Meeting on February 26, 2004

NOTE: There were no members of the public at the Public Exit Meeting.

Farley A&R Report
Attachment 2
Elements of an Aging Management Program for License Renewal

1	Scope of program	Scope of program should include the specific structures and components subject to an AMR for license renewal.
2	Preventive actions	Preventive actions should prevent or mitigate aging degradation.
3	Parameters monitored or inspected	Parameters monitored or inspected should be linked to the degradation of the particular structure or component intended function(s).
4	Detection of aging effects	Detection of aging effects should occur before there is a loss of structure or component intended function(s). This includes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new one-time inspections to ensure timely detection of aging effects.
5	Monitoring and trending	Monitoring and trending should provide predictability of the extent of degradation, and timely corrective or mitigative actions.
6	Acceptance criteria	Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the structure or component intended function(s) are maintained under all CLB design conditions during the period of extended operation.
7	Corrective actions (Audited by DIPM)*	Corrective actions, including root cause determination and prevention of recurrence, should be timely.
8	Confirmation process (Audited by DIPM)	Confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.
9	Administrative controls (Audited by DIPM)	Administrative controls should provide a formal review and approval process.
10	Operating experience	Operating experience of the aging management program, 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 function(s) will be maintained during the period of extended operation.

* DIPM, NRR Division of Inspection Program Management

Farley A&R Report

Attachment 3
Audit and Review Follow-Up Items

Follow-up Item	Description	Resolution
Section 7.2.1.1.2	The project team requested that the applicant provide clarification and revise its FNP LRA Table 3.1.1, Item 3.1.1-36, to indicate whether the ISI program is credited for the non-Class 1 piping and valve bodies and, if necessary, correct the apparent inconsistency. (RAI 3.0-1A)	April 16, 2004 (ML041180569)
Section 7.2.1.2.3	The applicant states that the FNP - License Renewal Future Action Commitment list will be revised to include the inspection plan for the FNP RVIs which will be submitted for staff review and approval 24 months prior to implementation.	July 27, 2004 (ML042180163)
Section 7.2.1.2.4	The project team asked the applicant to provide the number of ASME Class 1 small bore piping weld locations that are in the scope of the FNP LRA under risk-informed inservice inspection that will be volumetrically examined.	July 9, 2004 (ML042010294)
Section 7.2.1.2.6	The applicant states that the FNP - License Renewal Future Action Commitment list will be revised to include the inspection plan for the FNP RVIs which will be submitted for staff review and approval 24 months prior to implementation.	July 27, 2004 (ML042180163)
Section 7.2.1.2.8	The applicant states that the FNP - License Renewal Future Action Commitment list will be revised to include the inspection plan for the FNP RVIs which will be submitted for staff review and approval 24 months prior to implementation.	July 27, 2004 (ML042180163)
Section 7.2.1.2.9	The applicant states that the FNP - License Renewal Future Action Commitment list will be revised to include the inspection plan for the FNP RVIs which will be submitted for staff review and approval 24 months prior to implementation.	July 27, 2004 (ML042180163)

Farley A&R Report
Attachment 3 (Continued)
Audit and Review Follow-Up Items

Follow-up Item	Description	Resolution
Section 7.2.3.1.3	The project team questioned why the one-time inspection program was not credited in the Table 3.3.2-14 line items for carbon steel fuel oil storage and EDG day tanks exposed to a fuel oil environment. FNP LRA Section 3.3.2.2.7 states that both the fuel oil chemistry program and one-time inspection program manage aging of carbon steel fuel oil storage and EDG day tanks exposed to a fuel oil environment. The applicant concurred that this was an editorial error in that the one-time inspection program should have been credited with the fuel oil chemistry program in Table 3.3.2-14. The applicant stated that this item will be corrected in a supplemental submittal to the NRC.	May 28, 2004 (ML041560314)
Section 7.2.3.2.2	The project team noted that it is not clear which AMP is credited. In its discussion, the applicant indicated that this was an editorial error. The correct AMP is the one-time inspection program. This issue remains open pending receipt of a written statement from the applicant.	May 28, 2004 (ML041560314)
Section 7.2.3.2.9	The applicant credits FNP AMP B.3.2,"Water Chemistry Control Program," to manage the aging effect of cracking. Furthermore, 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 project team 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 captured in the commitment list nor in FNP LRA, Appendix A, for the UFSAR supplement.	July 27, 2004 (ML042180163)
Section 7.2.5.1.1	The project team requested the applicant to confirm that the structural monitoring program is credited for structural steel. The applicant indicated that this was an editorial error. The structural monitoring program should also have been included in Table 3.5.2-1. This issue remains open pending receipt of a written statement from the applicant.	May 28, 2004 (ML041560314)

Farley A&R Report
Attachment 4

List of Documentation Reviewed

The following is a list of applicant documents reviewed by the project team, including documents prepared by others for the applicant. Inclusion of a document on this list does not imply that the project team reviewed the entire document, but, rather that selected sections or portions of the documents were reviewed as part of the overall effort documented in this audit and review report. In addition, inclusion of a document in this list does not imply NRC acceptance of the document.

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Existing AMPs (B.3.0)		
Inservice Inspection Program (B.3.1)	XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD XI.M3, Reactor Head Closure Studs XI.M12, Thermal Aging Embrittlement of CASS XI.S1, ASME Section XI, Subsection IWE XI.S2, ASME Section XI, Subsection IWL XI.S3, ASME Section XI, Subsection IWF XI.S4, 10 CFR Part 50, Appendix J Program	FNP SP-LR-AMP-01, "ISI Program Master Document" FNP-1-M-097, ISI Plan, Unit 1 FNP-1-M-096, ISI Third 10-year Program Letter NL-03-1387 dated June 30, 2003 from Southern Company to NRC in response to Order EA-03-009 inspections FNP-0-NDE-100.23, Visual Examination VT-3 for supports FNP-0-M-093, Containment Inspection Plan FNP-0-NDE-100.24, Visual Examination VT-1 for IWE Components FNP-1/2-STP-609-0, Containment Tendon Surveillance Test FNP-0-NDE-100.26, Visual Examination VT-1C for Concrete FNP-0-NDE-100.27, Visual Examination VT-3C for Concrete FNP-1/2-STP-117, Containment ILRT FNP-1/2-STP-167, Containment Integrity

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
		Examination
Water Chemistry Control Program (B.3.2)	XI.M2, Water Chemistry XI.M21, Closed-Cycle Cooling Water System	FNP SP-LR-AMP-03, "Closed Cooling Water Chemistry Control Master Document," Rev. 0 FNP NUREG-1801 Program Exception Comparison FNP Closed-Cycle Water Chemistry Control Program Exception Comparison. EPRI TR-107396, October 1977 EPRI TR-105714, Revision 3 EPRI TR-105714, Rev. 4 EPRI TR-102134, Rev. 5 FNP SP-LR-OER-001, Operating Experience Report FNP-O-ACP-58.3, Version 1.0 FNP LRA, Appendix A, Section A2.2 FNP-0-CCP-202, Version 84.0, Tables 10 and 16. FNP CCW Pumps 1A/1B and 2A/2B Quarterly Testing Results.

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Service Water Pond Dam Inspection Program (B.3.3)	XI.S7, RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants	FNP SP-LR-AMP-05, "Service Water Pond Dam Inspections Master Document," dated October 30, 2003. Service Water Storage Pond Dam Biennial Inspection, FNP Engineering Technical Procedure, FNP-0-ETP-9389, Rev. 3, September 21, 1998. FNP, Cooling Water Storage Pond Biennial Inspection Report, dated January 30, 2003.
Reactor Vessel Surveillance Program (B.3.4)	XI.M31, Reactor Vessel Surveillance	**DE staff to review**
Borated Water Leakage Assessment and Evaluation Program (B.3.5)	XI.M10	**DE staff to review**

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Overhead and Refueling Crane Inspection Program (B.3.6)	XI.M23, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System	FNP SP-LR-AMP-08, "Overhead and Refueling Crane Inspections," dated November 2, 2003 FNP Draft License Renewal Position Evaluation and Disposition, "Evaluate If Tracking of Crane Lifts Is Needed," dated October 31, 2003 Maintenance Procedure FNP-0-MP-30.3, "Spent Fuel Cask Crane Annual Mechanical Check," Version 10.0, issued November 27, 2000 FNP Maintenance Procedure FNP-2-MP-11.3, "Reactor Polar Crane Annual Check," Rev. 7, issued May 26, 1999 Maintenance Procedure FNP-1-MP-11.1, "Reactor Polar Crane Monthly Check" Fuel Handling Procedure FNP-1-FHP-5.13, "Manipulator Crane," Version 10.0, issued May 12, 2003 NUREG-1774, "A Survey of Crane Operating Experience at U. S. Nuclear Plants from 1968 through 2002"

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Environmental Qualification Program (B.3.7)	XI.E1, Environmental Qualification (EQ) of Electrical Components	FNP SP-LR-AMP-09-R0 (previously LRSC-SNC-161-R2), "Environmental Qualification Program Master Document," October 22, 2003 FNP-0-M-60, "Environmental Qualification Program Description," Version 4, February 27, 2003 FNP-0-ETP-4108, "Environmental Qualification Program Implementation," Version 16, February 27, 2003
Steam Generator Program (B.3.8)	XI.M19, Steam Generator Tube Integrity	FNP SP-LR-AMP-10, "Steam Generator Program Master Document," dated October 31, 2003 FNP NMP-ES-004, "SNC Steam Generator Program (FNP, VEGP)," Version 1.0, effective September 26, 2003 Administrative Control Procedure FNP-0-ACP-58.0, "FNP Steam Generator Program," version 1.0, dated October 24, 2001 System Performance Procedure FNP-0-SYS-3.0, "Steam Generator Tube Surveillance Program," version 7.0, dated July 25, 2003 System Performance Procedure FNP-0-SYS-3.1, "Steam Generator Secondary Side Program," Version 1.0, dated December 26, 2001 FNP Technical Specification, Section 3.4.13, "RCS Operational Leakage," Amendment No. 147 (Unit 1) and Amendment No. 138 (Unit 2) FNP Technical Specification, Section 5.5.9, "Steam Generator (SG) Tube Surveillance

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
		Program," Amendment No. 147 (Unit 1) and Amendment No. 138 (Unit 2) WCAP-12299, "Alloy 690 Tapered Mechanical Plug Summary Qualification Report," Rev. 1
Enhanced AMPs (B.4.0)		
Flow Accelerated Corrosion Program (B.4.1)	XI.M17, Flow-Accelerated Corrosion	FNP SP-LR-AMP-11, "Flow-Accelerated Corrosion Program Master Document," Rev. 0, October 23, 2003 FNP SNC FAC-202L, FAC Program Manual FNP-O-NDE-100.36, 6/1/01, UT FAC Examination Procedure
Fuel Oil Chemistry Control Program (B.4.2)	XI.M30, Fuel Oil Chemistry	FNP SP-LR-AMP-12, "Fuel Oil Chemistry Control Program Master Document," dated October 27, 2003 FNP-0-CCP-332, "Chemical Addition to Diesel Fuel Oil Tanks," Version 10.0, March 12, 2003

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Structural Monitoring Program (B.4.3)	XI.S5, Masonry Wall Program XI.S6, Structures Monitoring Program	FNP SP-LR-AMP-13, "Structural Monitoring Program Master Document," dated October 20, 2003 Maintenance Rule, Structure Monitoring Program, FNP Engineering Support, FNP-0-SYP-18, Version 3, July 17, 2003. FNP Maintenance Rule Structural Monitoring, 1997- Baseline Inspections, August 13, 1997 FNP Maintenance Rule Structural Monitoring, 1996- Baseline Inspections, December 9, 1996 Farley Condition Report #2001001490, June 19, 2001 FNP Action Item 200220065, Source Document 2001001490 FNP Operating Experience Evaluation Program, Administrative Procedure, FNP-0-AP-65, Rev. 0, October 12, 1999

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Service Water Program (B.4.4)	XI.M20, Open-Cycle Cooling Water System	FNP SP-LR-AMP-14, "Service Water Program Master Document" Generic Letter 89-13, Dated July 21, 1989 FNP Implementation of GL 89-13 FNP-0-82, Revision 6, Service Water Plan, July 21, 2003 FNP REA 02-2577-02, Attachment 2, "SW UT and RT Report" FNP REA 2000-2301, Attachment "Evaluation of Pin-Hole Leak in SW Minimum Flow Line FNP LRA, Appendix A, Section A2.11
Fire Protection Program (B.4.5)	XI.M26, Fire Protection XI.M27, Fire Water System	FNP SP-LR-AMP-15, "Fire Protection Program Master Document," dated October 30, 2003 FNP-1-FSP-65.2, "FNP Fire Surveillance Procedure - Fire Door Inspection," Version 2.0, April 4, 2003 FNP-1-FSP-405, "FNP Fire Surveillance Procedure - Preaction Sprinkler System (Annual)," Version 11.0, June 2, 2003
New AMPs (B.5.0)		

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Reactor Vessel Internals Program (B.5.1)	XI.M13, Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) XI.M16, PWR Vessel Internals	**DE staff to review**
Flux Detector Thimble Inspection Program (B.5.2)	N/A	**DE staff to review**
External Surface Monitoring Program (B.5.3)	Plant Specific	FNP SP-LR-AMP-18, "External Surfaces Monitoring Program Master Document," Rev. 1
Buried Piping and Tank Inspection Program (B.5.4)	XI.M34, Buried Piping and Tanks Inspection	FNP SP-LR-AMP-19, "Buried Piping and Tank Inspection Master Document," dated October 31, 2003 FNP Nondestructive Examination Program, FNP-0-M-024, Version 17.0, November 5, 2000 FNP Maintenance Procedure, FNP-0-MP-54.0, Version 3.0, September 17, 2003, "Coating, Wrapping and Surface Testing of Underground Pipe and Tanks" FNP Corrective Action Program NMP-GM-002, Version 1.0, June 27, 2003 FNP Administrative Procedure FNP-0-AP-30, Version 36.0, July 14, 2003, "Condition Reporting Generic Information and Preparation and Processing of Licensee Event Reports"

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
One-Time Inspection Program (B.5.5)	XI.M32, One-Time Inspection XI.M33, Selective Leaching of Materials	FNP SR-LR-AMP-20, "One-Time Inspection Program Master Document"
Non-EQ Cables Program (B.5.6) 1) Used in instrumentation circuits	XI.E2, Electrical Cables not Subject to 10 CFR 50.49 Environmental Requirements Used in Instrumentation Circuits	FNP SP-LR-AMP-21, "Non-EQ Cables Program Master Document," Revision 0, October 23, 2003 and Revision 1, December 12, 2003 FNP- "A Plant-Specific Program Attribute Comparison [for the] non-EQ Cables Program," Version 1 FNP-0-AP-65, "FNP Operating Experience Evaluation Program," Revision 10, October 12, 1999.
2) Exposed to adverse localized environments and inaccessible medium voltage cables	XI.E1, Electrical Cables and Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements XI.E3, Inaccessible Medium Voltage Cables not Subject to 10 CFR 50.49 Environmental Qualification Requirements	FNP SP-LR-AMP-21, "Non-EQ Cables Program Master Document," Revision 0, October 23, 2003 and Revision 1, December 12, 2003 FNP-0-GMP-60.1, "Farley Nuclear Plant General Maintenance Procedure - General Inspection Outdoor Electrical Duct Run Pull Boxes," Version 2.0, July 11, 2003

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
Fatigue Monitoring Program (B.5.7)	XI.M1, Metal Fatigue of Reactor Coolant Pressure Boundary	FNP SP-LR-AMP-22, "Fatigue Monitoring Program," October 30, 2003 FNP "FatiguePro" Rev. 3, SIR-96-10. FNP "Cycle Counting Logic for the Automated Cycle Counting System at Farley 1 and 2," SIR-02-142, Rev. 0. SIA File No. FNP-01Q-301, 302, 303, and 304, Rev. 0, and 305 Rev.1, (Fatigue and Fen Calculations).
NiCrFe Component Assessment Program (B.5.8)	N/A	**DE staff to review**

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
References Reviewed by Project Team Members for AMR Review	N/A	NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, April 2001 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Volume 1 and Volume 2, April 2001 FNP Commodity Group Reviews for Commodities in Specific Environments FNP Commodity Group Reviews for Mechanical Components FNP Commodity Group Reviews for Materials, Environment, and Aging Effect Combinations NRC Information Notice 92-20, Dated March 3, 1992, Subject: Inadequate Local Leak Rate Testing NRC Information Notice 90-04, Dated January 26, 1990, Subject: Cracking of the Upper Shell-To-Transition Cone Girth Welds in Steam Generators Electric Power Research Institute*, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools*, EPRI 1003056, Rev. 3 Letter Dated September 12, 2003 from Southern Nuclear Co., to the U.S. Nuclear Regulatory Commission (NRC) - Application for renewal of Operating Licenses 50-348 and 50-364 for Joseph M. Farley Nuclear Plant, Units 1 & 2 (ML032721360)

Farley A&R Report
Attachment 4 (Continued)
List of Documentation Reviewed

Applicant's Aging Management Program	GALL Report Aging Management Program	LR-AMP Master Document and Other Documents Reviewed
References Reviewed by Project Team Members for AMR Review (Continued)	N/A	Letter NL-03-2418 dated December 5, 2003 from Southern Company to NRC in response to Requests for Additional Information (RAIs) (ML033430278) Letter NL-04-0318 dated March 5, 2004 from Southern Company to NRC in response to Requests for Additional Information (RAIs) (ML040710873) Letter NL-04-0473 dated April 7, 2004 from Southern Company to NRC in response to Requests for Additional Information (RAIs) (ML041050600) Letter NL-04-0678 dated April 22, 2004, from Southern Company to NRC in response to Requests for Additional Information (RAIs) (ML041190361)

Farley A&R Report
Attachment 5
Commitments to be Included in the Safety Evaluation Report

No.	Audit and Review Report Section	Commitment
1	7.1.7.4	The auxiliary feedwater pump turbine exhaust piping will be added to the scope of the FAC program prior to the period of extended operation.
2	7.1.8.4	The applicant will evaluate the scope of the program, 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 prior to the period of extended operation.
3	7.1.9.1.1	The applicant states further that the program scope will be enhanced to include additional structures and components during the period of extended operation which are in scope for license renewal but are not currently monitored under the program. An enhancement will also be made to the structural monitoring program document to clarify which hangers and supports are to be inspected in Category 1 buildings.
4	7.1.10.4	The scope of the service water program will be enhanced prior to the extended period of operation to include inspection of piping from the main SW header to the air compressor credited for 10 CFR 50, Appendix R, safe shutdown, and the service water pump columns.
5	7.1.11.4	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.

Farley A&R Report
Attachment 5 (Continued)
Commitments to be Included in the Safety Evaluation Report

No.	Audit and Review Report Section	Commitment
6	7.1.11.4	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 ten 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 CO_2 hoses at five-year intervals will be formalized in fire protection procedures.
7	7.1.12.2	The External Surfaces Monitoring Program will be a new plant-specific condition monitoring program that will be implemented prior to entering the period of extended operation. It will include periodic visual inspections of external surfaces of carbon steel, low alloy steel and other susceptible materials in components requiring aging management for license renewal. Plant procedures and administrative controls will be developed to provide for surface condition monitoring of selected equipment and components for signs of corrosion or wear. Periodic inspections of accessible portions of piping and tubing will be performed to detect signs of loss of material, flange leakage, missing or damaged insulation, damaged coatings, and fretting of tubing. Accessible in-scope polymers or elastomers will also be inspected for age related degradation. Susceptible materials or components will include accessible fasteners, ventilation systems seals and collars, other polymers and elastomers, copper, aluminum and coated steel structural components which are not within the scope of the Structure Monitoring Program.

Farley A&R Report
Attachment 5 (Continued)
Commitments to be Included in the Safety Evaluation Report

No.	Audit and Review Report Section	Commitment
8	7.1.13.6	The new Buried Piping and Tank Inspection Program will be used to manage the loss of material from external surfaces of pressure-retaining buried carbon steel piping and tanks 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.
9	7.1.14.2	The One Time Inspection 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. The program will be administratively controlled by plant procedures. Administrative controls and procedures will be developed to identify the specific components which must be included, as well as the systems from which the remaining sample set will be collected.
10	7.1.15.2 7.1.16.6	The Non-EQ Cables Program will be a new monitoring program that will be implemented prior to the period of extended operation. It will be used to maintain the function of electrical cables which are not subject to the environmental qualification requirements of 10 CFR 50.49, but are exposed to adverse localized environments caused by heat, radiation or moisture. The program will be administratively controlled by procedures. The scope will include: 1) accessible electrical cables installed in adverse localized environments caused by heat or radiation, coupled with the presence of oxygen, 2) electrical cables used in circuits with sensitive, high voltage, low-level signals such as radiation monitoring and nuclear instrumentation and, 3) inaccessible medium voltage cables that are exposed to significant moisture and voltage at the same time.

Farley A&R Report
Attachment 5 (Continued)
Commitments to be Included in the Safety Evaluation Report

No.	Audit and Review Report Section	Commitment
11	7.1.17.6	The Fatigue Monitoring Program will be used to monitor plant transients that are significant contributions to the fatigue cumulative usage factor. The applicant will fully implement the program prior to entering the period of extended operation. When fully implemented, the program will include monitoring for thermal stratification at susceptible locations in addition to the current transient counting required by Technical Specifications.
12	7.2.1.2.3 7.2.1.2.6 7.2.1.2.8 7.2.1.2.9	The applicant will revise the FNP - License Renewal Future Action Commitment List to include the inspection plan for the FNP RVIs which will be submitted for staff review and approval 24 months prior to implementation.
13	7.2.3.2.9	The applicant states that it will revise the Farley Nuclear Plant - License Renewal Future Action Commitment list and included the following statement in Item 10, under specific components included in sample population: Reactor coolant system small bore (< 4 NPS), butt-welded piping (This inspection will serve as an indicator of the potential for SCC of other stainless steel components exposed to a borated water environment.)